THE ANATOMY OF Humane Bodies IMPROV'D,

According to the *Circulation of the Blood*, and all the Modern Discoveries.

Publickly Demonstrated at the THEATER In the ROYAL GARDEN at *PARIS*,

BY

Monsieur *DIONIS*, Chief Surgeon to the late Dauphiness, and to the present Dutchess of BURGUNDY.

Translated from the Third Edition, Corrected and Enlarged by the AUTHOR,

With an Ample Dissertation upon

The Nature of GENERATION;

And several New Systems.

With FIGURES *of all the Parts of the Body*,

AND

An Useful INDEX *of the Principal Matters.*

LONDON,

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THOEN

October the 26th. 1702.

WE the *President* and *Censors* of the *Royal College* of PHYSICIANS in *London*, whose Names are hereunto subscrib'd, having Perus'd and Approv'd this Anatomical and Physical Book, entitled, [*The Anatomy of Humane Bodies Improv'd, according to the Circulation of the Blood, and all the Modern Discoveries; Publickly Demonstrated at the* Theater *in the* Royal Garden *at* Paris, *by Monsieur* DIONIS, *Chief Surgeon to the late Dauphiness*, &c.] do judge it Worthy to be made Publick.

Tho. Millington, President.

Walter Charleton,
Robert Pitt,
Samuel Garth,
Humphry Brooke,
} Censors.

THE TRANSLATOR's PREFACE.

THough the World is overſtock'd with Books on all Subjects, yet the Publication of this will be reckon'd no diſſervice, by thoſe, who are acquainted with its diſtinguiſhing Excellency. The Multitude of ſuperficial performances, can be no Argument againſt the reception of a choice Treatiſe; provided the Reader *is ſo wiſe as to diſtinguiſh Lumber from an uſeful Piece. Not that I mean to detract from our* Engliſh Anatomiſts, *in order to magnify a forreign performance: For I am very ſenſible that* England *has produc'd as great Men in that way as any Nation in the World, and that the Diſcoveries they have made and communicated to the World in the Language of the Learned, are at leaſt of equal Importance with any that have appear'd elſewhere.* The Circulation of the Blood, *diſcovered by our Countryman Dr.* Harvey, *is a laſting Monument of* Engliſh *Induſtry; and what he in former times Demonſtrated to our Reaſon, is now made viſible to the Eye by the help of Microſcopes. But 'tis needleſs to vindicate the Ingenuity of our*

Engliſh Anatomiſts, *ſince the forreign World is ſo ſenſible of their Merit.*

I only ſay that I take this Anatomical Treatiſe *to be the moſt methodical and the compleateſt General Syſteme that has yet appear'd in any Language. 'Tis not the product of pure Theory, but real Matter of Fact; being a full Deſcription of what was actually and viſibly Demonſtrated by the Sieur* Dionis, *a famous* French Surgeon, *before a very great Audience; for beſides the Learned Faculty of* Paris, *and the Company of Maſter-Surgeons, the Students of both Profeſſions, and ſeveral other curious Gentlemen were preſent: And indeed it muſt be own'd that among many great things which the* French *King has done for the Advancement of Learning, that Noble Structure of the Theater, where* Anatomical Exerciſes *and* Chirurgical Operations *are publickly ſhewn at his charge, has a juſt Title to the firſt rank.*

In a word, the Book will ſpeak ſufficiently for it ſelf; for here every Part of a Humane Body is ſo fully and narrowly ſurvey'd; The Subſtance, Magnitude, Connexion, and Uſes of every Part are ſo clearly explain'd; that nothing can be wanting to the Satisfaction of thoſe who are curious in this way, and the Inſtruction of the Students of Phyſick *and* Surgery. *Here the* Reader *will meet with all the new Diſcoveries, that of late years have been ſo plentifully made by the help of Microſcopes; for want of which the Ancients could not reach ſuch uſeful parts of Knowledge. In fine, the whole Series of theſe* Lectures *or* Demonſtrations, *is ſuited to the Modern Diſcoveries, and interlac'd with diſtinct Accounts of the reſpective Hypotheſes.* When

The TRANSLATOR's PREFACE.

When our Author ſpoke theſe Lectures, *he Diſſected at the ſame time; and ſhew'd the Parts to the Eye, while he diſcourſed their Deſcription and Uſes. For this reaſon he gives his Diſcourſes the Title of* Demonſtrations, *and the Tranſlator thought it improper to depart from the Author's choice.*

They have bore Three Impreſſions in French, and one in Latin; But the Third Edition, from which this Tranſlation is took, contains not only very large Additions, but very material and frequent Alterations; and for that reaſon 'tis preſum'd this Tranſlation may juſtly claim a preference to the Latin, which was done from the Firſt Edition.

THE

THE AUTHOR's PREFACE.

THO' *Anatomy* was very imperfect in the time of the Ancient Philosophers, yet, in regard of the excellency of its object, they allotted it the first rank among the natural Sciences. But what respect does it now deserve at our hands? Now that 'tis become the most certain of all the parts of Medicine, by vertue of the great number of discoveries that have been made, and are still pursued every day.

Those who are *Happily* dispossess'd of a partiality to the Ancients, and follow such principles as are grounded upon Experience and Reason; Those, I say, oblige us with a clear and mechanical explication of all the Points in *Anatomy*, that we formerly reckon'd the obscurest and most perplex'd.

I say, *Happily*; For the Ancients being unacquainted with the Course of the Blood, and fancying that the Liver sent it out by the Veins to all the parts of the Body in order to their nourishment; 'twas impossible they should avoid Errour, or draw just consequences from a false principle that is now sunk by the Circulation of the Blood.

I do not pretend to prove the Circulation of the Blood in this Preface; The disposition of the parts, which you'll see in the insuing Course of *Anatomy*, will convince you more effectually than any

allegation I can produce. I only would give you to know, that through the whole courſe of theſe Lectures I lay down the Circulation of the Blood as a ſtanding principle, both for confirming the ſentiments of modern Authors, and confuting the Errours of the Ancients.

'Tis by the means of the Circulation that we trace the remoteſt Functions of the Humane Body: and diſcover that the faculties which the Ancients aſcrib'd to different Parts, to the Breaſts, for inſtance, a faculty of making Milk, to the Teſticles that of making Seed, *&c.* We diſcover, I ſay, that theſe faculties are only the ſeparation of the reſpective Liquors, which being firſt mingled with the Blood are filtrated and diſengag'd from its other Parts, in the Breaſts, Teſticles, *&c.*

If we do but conceive that this Circulation runs from the Center to the Circumference through the Arteries, and from the Circumference to the Center through the Veins; we'll preſently be ſenſible that not only theſe two Liquors (the Milk and the Seed) but all the other are ſeparated from the Blood by the ſole diſpoſition of the Parts, the figure of which is contriv'd ſo as to afford a paſſage to one ſort of Liquor rather than to another. 'Tis in this manner that the Animal juice is ſeparated by the Glands of the Brain, the *Saliva* by the Parotides and maxillary Glands, the Bile by the Glandules of the Liver, the Urine by the Kidneys, the Pancreatick juice by the Sweat-bread, and ſo on.

For a further Proof that all theſe Liquors are ſeparated from the Maſs of Blood by the means of the Circulation; we may look upon this as a certainty, that what we call Blood is only a mixture of ſeveral different Liquors, which being convey'd by the Arteries to all the parts of the Body fall off where they meet with ſuch Pores as are qualify'd to let 'em paſs. This ſeparation therefore is a conſequence of the ſtructure of the Parts, ſo that they ſtand in no need of the faculties call'd

Attra-

Attractrices, *Retentices*, and *Expultrices*; which the Ancients aſſign'd 'em without any ground.

For ſeveral Ages the World had ſuch a blind deference for theſe firſt Anatomiſts, that 'twas a crime to depart from their ſentiments; and nothing could paſs for truth, but what was found in their Writings, eſpecially thoſe of *Galen*, for whom they had a particular Veneration. But this Age has produc'd more curious and bold Anatomiſts, who have ſhook off the yoak of ſo ſevere a Law, it being oppoſite to Reaſon and to the progreſs of Sciences. Theſe Anatomiſts have had the courage to Publiſh their Diſcoveries, and have demonſtrated them notwithſtanding the bigotry and oppoſition of the ſticklers for Antiquity, who branded them for Innovatours and raſh Authors.

But after all, tho' I cenſure ſome Errours of the Ancients, yet, I do not mean that we are leſs obliged to them than to the Moderns. On the contrary, I affirm that we owe to them the firſt knowledge of Anatomy. Who can deny that *Galen* knew more of Anatomy than any that went before him? Doubtleſs, the Reaſon why he did not find out all, is becauſe one Man is not able to compaſs it.

The Diſcoveries of the Moderns ſtand upon the ſame foot; for 'tis certain that tho' they are very numerous, yet there are ſo many things left undiſcovered, that we ought ſtill to make freſh efforts for enlarging our knowledge. Beſides, there is ſo great a difficulty in diſtinguiſhing all the ſprings of our machine, that 'twill always leave work enough for the thoughts and the hands of thoſe who come after us, if they mean to give a mechanical explication of all the actions that retain to it.

We muſt not imagine that the new Diſcoveries have made any alteration in the Compoſition of Humane Bodies, or added any thing to it. The Compoſure is the ſame that it ever was: Only the

Moderns have found out ſome things in it, that were not formerly known. It falls upon the ſame lay with the Countries of *America* that have been diſcover'd within theſe few Ages: for 'tis very well known that theſe Countries are of equal ſtanding with the other parts of the World; only they were unknown to ſome Men, juſt as ſome Parts of the Body were to the ancient Anatomiſts.

The ſticklers for Antiquity, in oppoſition to the modern Diſcoveries, alledge; that 'tis of no uſe to know whether the Chyle is convey'd to the Liver by the Meſaraick Veins, or to the Heart by the Lacteal Veins and the Thoracick Duct; upon the conſideration that the reſolution of that queſtion either way makes no alteration in the practice of Phyſick, and that Phyſicians continue ſtill to purge and bleed juſt as they uſed to do in former times. But ſuppoſing it true, that ſuch diſcoveries do not alter the Cure of ſome Diſeaſes, yet 'tis certain they prevent miſtakes in the cure of others, and being grounded on a more ſure and ſolid foundation than that of the Ancients inable us to reaſon more juſtly.

If *Anatomy* is much indebted to *Harvey* who diſcover'd the Circulation, to *Virſungus* who found out the Pancreatick Duct, to *Aſellius* who firſt trac'd the Lacteal Veins, to *Pecquet* who firſt demonſtrated the Thoracick Duct, and to ſeveral other Moderns who have ſucceſsfully improv'd the Science; 'tis equally oblig'd to his Majeſty's goodneſs, who has re-eſtabiſhed the Publick Diſſections in the Royal Garden, and ordered Anatomical Lectures ſuitable to all the diſcoveries we have made of the Parts of Humane Bodies.

Theſe Anatomical Exerciſes were reviv'd in the Royal Garden, in the Year 1672; after a diſcontinuation of ſeveral Years. Mr. *de la Chambre* the Anatomy Profeſſor, being the Queen's Firſt Phyſician, was diverted from attending theſe Lectures: and therefore Commiſſion'd Dr. *Creſſé* a Member of the Faculty of *Paris* to pronounce the Anato-

mical

mical Diſcourſes, and nominated me for making the Diſſections and Demonſtrations.

Tho' this eſtabliſhment was of ſingular uſe to the Publick, yet it met with oppoſition from ſome, who pretended that the right of Diſſecting and making Anatomical Lectures was lodg'd in them only. But his Majeſty ſtiffled the oppoſition by a particular Declaration, which was ratify'd and recorded in the Parliament of *Paris*, *March* 1673. His Majeſty himſelf being preſent. In this Declaration, his Majeſty ordered that Anatomical diſſections and Chirurgical Operations ſhould be perform'd *gratis* and with open doors, in the Amphitheatre that he had built for that purpoſe in the Royal Garden; and that his Profeſſors ſhould have the preference of all others in being ſerv'd with ſuch Corps or Subjects as were neceſſary for carrying on theſe Exerciſes.

Purſuant to his Majeſty's commands, I Diſſected publickly for eight Years together, that is, from the Year 1673 to the Year 1680, at which time his Majeſty did me the honour to nominate me for being Firſt Surgeon to the Dauphineſs of *France*; and my acceſſion to this honourable Poſt oblig'd me to diſcontinue the publick Diſſections.

The number of Spectators, which always amounted to 4 or 500, was ſufficient evidence that my Diſſections pleas'd and were uſeful to the Publick. But the thing that perplex'd me moſt among ſo great a number of Scholars, was, that moſt of them ask'd me what Book they ſhould read in order to be acquainted with the Modern Diſcoveries, and to have a refreſhing view of the Parts that I ſhew'd 'em: For the Parts not being methodically deſcrib'd in any Book that I know, I proteſt I knew not which to pitch upon. 'Tis true, *Riolanus* and *Bartholin* ſeem to own the Circulation of the Blood, but at the ſame time all their writings are tinctur'd with the leaven of the Ancient Opinions, So that I could not poſſibly find them a truſty guide to

conduct them through the road that I had chalk'd out; and upon that score they desir'd an Impression of my Anatomical Demonstrations, which I had granted sooner if I had not been call'd to attend the Court.

Since that happen'd, Monsieur *de la Chambre* dy'd; and his place being fill'd by one of the most celebrated Anatomists, whose knowledge is infinitely preferable to mine, I hop'd to be excus'd from the trouble of Printing my Demonstrations, upon his promise to outdo all that went before him, and to oblige the Publick with a Course of Anatomy, that would be so perfect and so different from all the Books of that nature yet known, that the World would own him to be the fittest Person for a work of that importance.

Questionless, his great and continual services in the Academy of Sciences, have diverted him from putting in execution his project upon such a vast Subject: for the Publick has been big with hopes of some mighty performance for several years, and hitherto their hopes are frustrated. Upon this consideration, I resolv'd to Print my Demonstrations, in order to render the knowledge of Anatomy easy to the Students of Physick and Surgery.

I am very sensible that another might have been fitter for such a performance, and I protest sincerely that *that* was the chief Reason which mov'd me to put it off so long. Besides, I take the Character of an Authour to be such a dangerous thing, that I cannot assume it without reluctancy. But my regard to the publick interest, and the sense I have of the want of a Book to describe the Parts as they are publickly shewn, mov'd me to run the risque of all censures.

In this Treatise, the Osteology leads the Van; by reason that *that* Part commences our Exercises in the Royal Garden, and that the knowledge of the Bones ought to usher in that of all the other Parts.

Parts. I divide my Osteology into eight Demonstrations, *viz.* Two of the Bones in General, Two of the Bones of the Head, Two of those of the Trunk, and Two of those of the Limbs.

In the next place, I carry on our course in Ten Anatomical Demonstrations, *viz.* Four for the *Abdomen* or *lower-belly*; Two for the Parts of the *Thorax* or *Breast*; Two for those of the *Head*; and Two for the *Limbs*.

The beginning of each Demonstration is fronted by a *Table* that represents the Parts describ'd in that Lecture: And the Alphabetical Letters engrav'd in the Cut, are plac'd in the Margent of the Discourse that relates to such and such Parts; so that the Reader may have an easy recourse from the one to the other.

I own that 'tis more instructive to see any Part in a real Corps than in a Cut: But besides, that, these Cuts are very exact, and as correct as any are; Anatomical Dissections are so unfrequent in most Counties, that the Country Surgeons can scarce have the opportunity of seeing one in a lifetime: And 'tis upon their Account that I have caus'd these Plates to be engrav'd in order to supply the want of Anatomical Dissections. Their size is of a piece with that of the leaves of the Book; and tho' they are small, yet they are not the less useful, for I have us'd all possible exactness in ranging the parts of each Demonstration in a small compass.

I did not think it fit to divide my Demonstrations into Chapters, because they contain in a continued series all the Parts that I shew'd at each Lecture, with their Names mark'd in the Margent. This method I took to be more proper for Students, to the end that they might not be put to the trouble of hunting through different Chapters for the Parts that fall within one Demonstration. Pursuant to this method 'twill cost them but ten days labour to view all the Parts of a Man, and so

they will easily trace the greatest curiosities of Anatomy.

My repeated reflections upon the business of my profession, and the reading of new Physical Books, which I always take care to pick up; have given mean opportunity of correcting in this third Impression many of my first thoughts, and adding such of the modern Systems as I found most reasonable.

To this last Edition I have added a Dissertation upon the nature of Generation, which proves the Systeme of the Eggs, and explains it after a new manner. If the Reader vouchsafes to peruse it with attention, he'll find that my Reasons are only grounded upon the structure of the Parts, and such matter of fact, as shews, that Man and all other Animals are ingendred by the means of Eggs.

I have likewise added an account of a particular case which was sent me from *Brest*. I mean, *that* of the extraordinary dilatation of an Auricle of the Heart, which will surprize all that look upon it. I have caus'd it to be drawn in its natural dimensions, and the Narrative is real matter of fact.

The CON-

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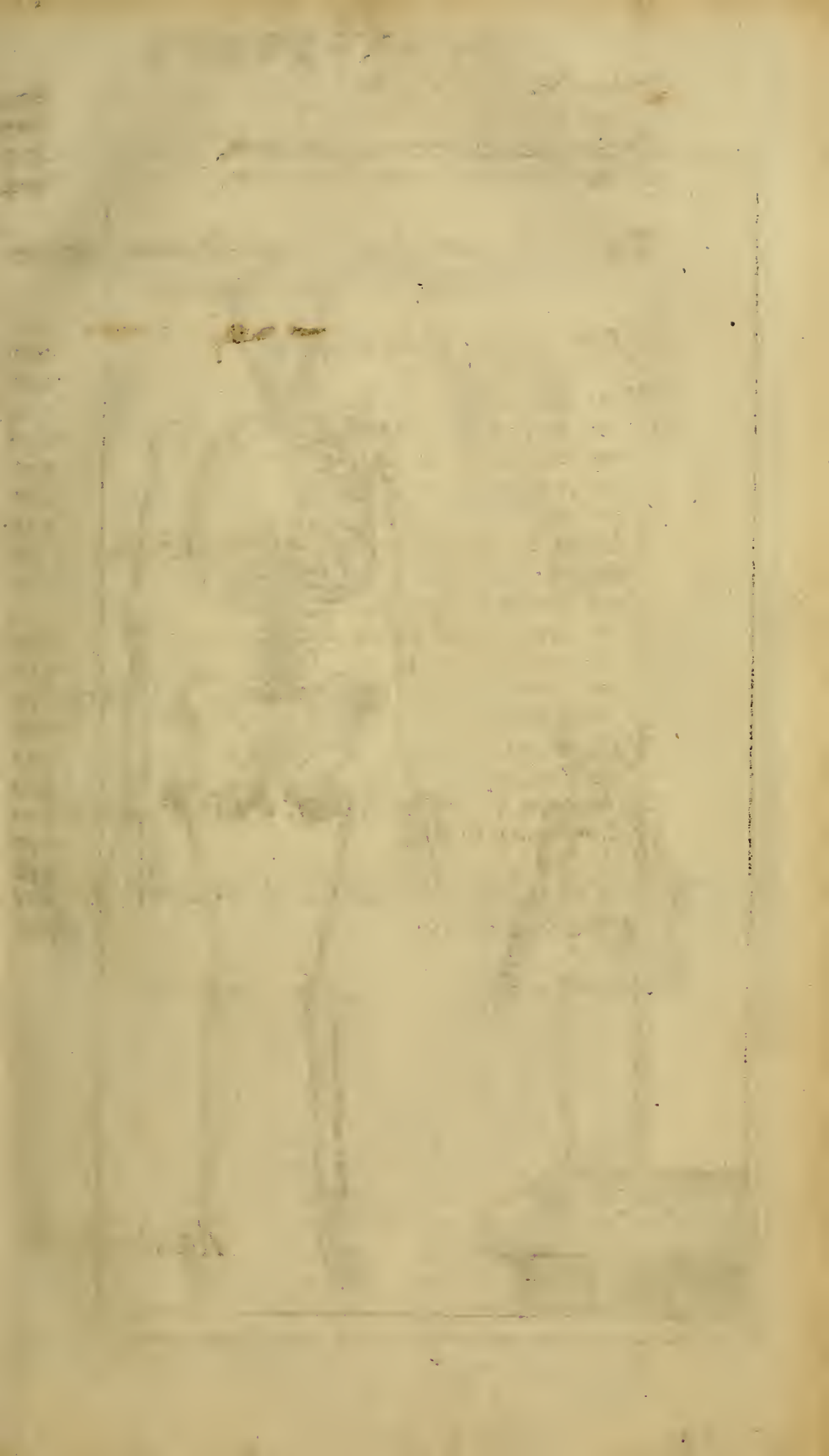

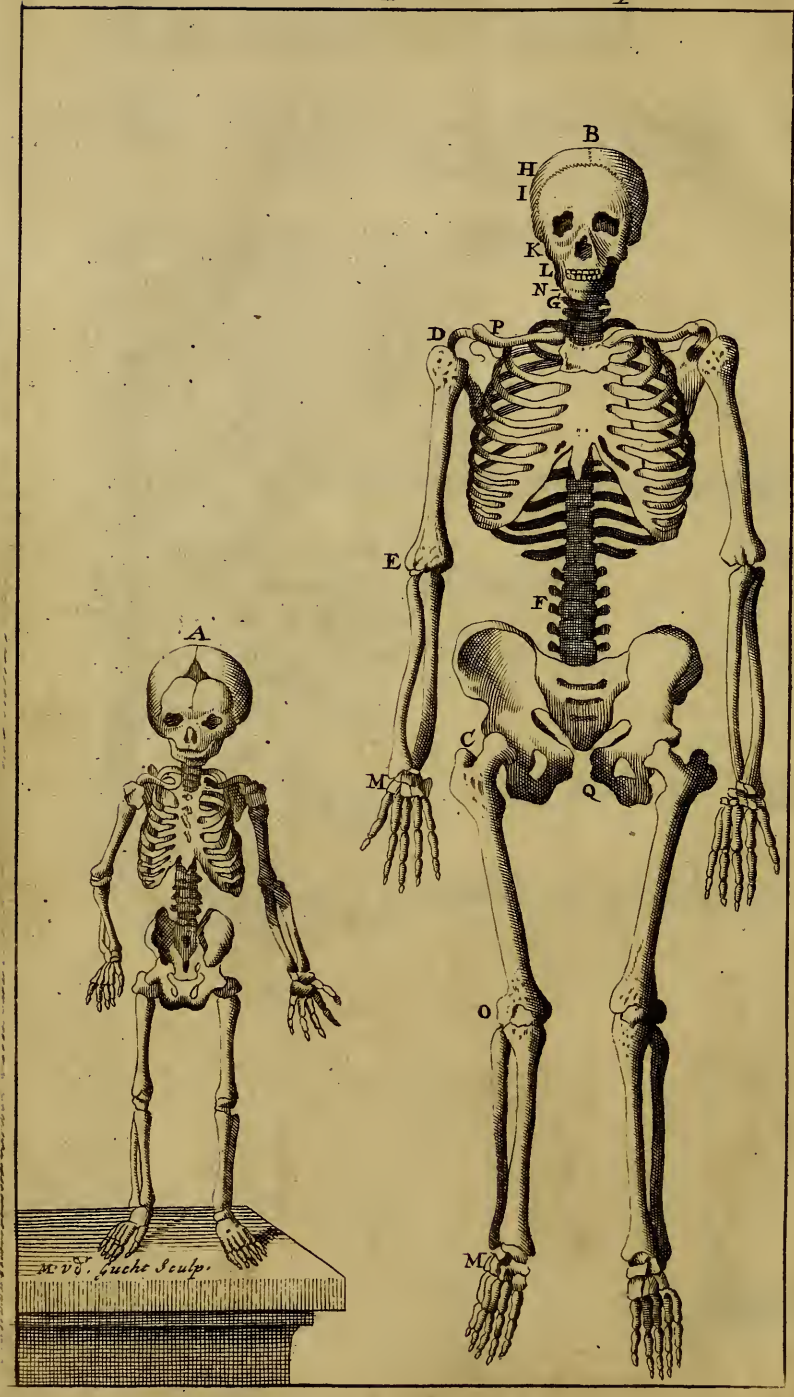
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Anatomical Demonſtrations:

OR,

LECTURES

Made in Publick at the King's *Phyſick-Garden* in *Paris.*

Of the BONES in General.

The FIRST DEMONSTRATION.

YOU know, Gentlemen, that SURGERY is an Operation of the Underſtanding, which conſiders the Maladies of a Humane Body; and that it is likewiſe an Operation of the Hand, which manages the Inſtruments and Remedies that are requiſite to cure them: inſomuch that for the better performing what is required, not only the knowledge of a ſound ſtate ought to precede that of an infirm, but the Surgeon ought to know Man in his perfect ſtate, and the good conformation of all Parts of his Body, that he may be the better able to re-eſtabliſh his Health, when it comes to be altered or deſtroyed, by ſome Diſeaſe, or ill Accident. It is by Anatomy, Gentlemen, that he muſt acquire this Knowledge, ſeeing it is the *baſis* and foundation of Surgery; it is by this, that he unravels and diſſects the moſt minute Parts, of which this admirable Structure is compoſed, that he ſearches into all the

What Surgery is.

The Uſefulneſs of Anatomy.

ſprings and motions, and finds out whatever is curious or ſecret in Nature.

And here would be a fair opportunity to praiſe and extol Anatomy, and to let you know at the ſame time the indiſpenſable neceſſity of underſtanding it, if a Man would ever become an expert Surgeon. But being perſuaded that all this Aſſembly, though very numerous, are ſufficiently convinced of this truth, I thought it more proper to enter immediately upon our buſineſs, and to examine with what Parts of the Body we are to begin.

Bartholin's Opinion.

Authors are divided in their Opinions upon this Article. *Bartholin* thinks we ought to begin with the Teguments, to proceed with examining the *Viſcera* and Muſcles, and finiſh with the Bones. His reaſon is, that the Bones cannot be examined, but when they come in their order to be viewed; and that their view can't be taken, till all the other Parts have been ſeparated from them.

Galen's Opinion, which Parts are firſt to be conſidered.

On the contrary, *Galen* would have us begin with the Bones, and gives ſeveral Reaſons for his Opinion. He ſays, it is the Bones which do give Man that erect figure, which he has by way of excellence above all other Creatures; and that by their being a foundation and ſupport to the reſt of the Body, they do likewiſe ſerve for a connexion of the Muſcles: And he maintains, that it is impoſſible to underſtand *Myology*, until he has known the Bones, and what gives the Muſcles their origin and inſertion. For Example, he ſhews, That if the Surgeon does not know what the *Humerus* is, the *Scapula* and the *Clavicle* when the *Muſculus Deltoides* is ſhewn, which is one of thoſe that help to lift the Arm upwards, he would have no comprehenſion of the matter, when he were told that this Muſcle has its origin from the middle of the Clavicle, the *Acromium*, and from all the Spine of the *Scapula*, and that it proceeds to make its inſertion about the middle of the *Os Humeri*. And laſtly, he adds, That the Bones being perforated in divers places for tranſmiſſion of the Nerves, Arteries and Veins, the ways and *Ductus* through which they do paſs can never be explained, before the ſtructure and diſpoſition of the Bones is firſt known.

Why a Skeleton is firſt to be known.

Laurentius adds to theſe Reaſons, That in the Schools of *Alexandria* a Skeleton was firſt of all brought to the view of all Students in Phyſick and Surgery, as the only means for their attainment of the knowledge of a Hu-

a Humane Body, and for the practice of Surgery in all its Operations. In effect, how can a Surgeon make reduction of Fractures and Dislocations, if he does not understand the structure of the Bone that is fractured and dislocated; if he does not know that the Bones of the Leg, or Arm, are forty days in forming their *Callus* when fractured; that the Clavicle requires thirty days, and the Ribs twenty; that the *Callus* is sooner made in Infants than adult Persons, because their Bones are more tender and consequently fuller of moisture. And lastly, that to cure a Wound where the Bone lies bare or is injured, he ought to know the substance of the Bones, and that some of them are softer, and exfoliate more slowly, and that the exfoliation which happens at the extremities of a Bone is sooner made than that of the middle, because this is always more solid than the extremities.

Reasons for beginning with a Skeleton.

The Reasonings of *Galen*, and *Laurentius* do become the stronger, from what does happen in Publick Anatomies; we find that though they are constantly made in the Winter time, yet we have much adoe to keep the Body sweet, during the operations, and by reason that we have such a multitude of parts to examine, we are fain to lay aside the Osteology for those times, because that may be more conveniently shewn with a Skeleton at any time of the year. All these reasons therefore ought to convince, that we ought to begin with the demonstration of a Skeleton, before we come to make the Dissection.

What a Skeleton is.

A Skeleton is an orderly connexion of all the Bones that belong to a Body. There are two sorts of them; the one Natural, which is prepared with all its proper ligaments, and where the Bones have never been separated asunder; such as is this little one, represented in the first of these Tables; and the other is Artificial, when the Bones are joined together with wires, such as is the great one there described, and upon which I shall pursue my demonstration of Osteology.

A
A Natural Sceleton.

B
An Artificial Skeleton.

The Etymology of Osteology.

The Science which treats of Bones is called Osteology, from the Greek ὀστέον, signifying a Bone, and λόγος, a discourse.

Two things to be examined in Bones.

All that this Science contains, is reduced to the examination of what belongs to the Bones in common, and what to each in particular.

What is common to them in general.

We shall understand what belongs to them in common, after we shall have examined six things, which are

their Definition, their Differences, their Articulations, their Cauſes, their Parts, and their Number.

What is common to them in particular.

I will alſo remark to you what belongs to them in particular, when I come to treat of each Bone ſeparately by it ſelf.

Two demonſtrations of the Bones in general.

I do purpoſe to give you two demonſtrations of the Bones in general; in the firſt I ſhall only ſpeak of their Definition, their Differences, and their Articulations; and in the other I ſhall entertain you with diſcourſing on their Cauſes, their Parts, and their Number.

What a Bone is according to the Antients.

A Bone is Defined by *Galen*, to be the hardeſt, the dri-eſt, and moſt terreſtrious part of all the Body. *Laurentius* adds to this Definition, *engendred by the formative faculty, through the means of a great heat, from the thickeſt and moſt terreſtrious part of the* Semen, *to be a ſupport to all the body, and to give it its rectitude and figure.*

I cannot allow of this laſt Definition, becauſe it comprehends divers things that appear to me to be uſeleſs, and that this Word, *Faculty*, does not agree either with the Idea that we have of the formation of Bones, nor with their Uſes. It is true the Antients made uſe of it for explaining all the actions and functions of the Body. And when they were asked how the Chyle, or the Bloud was formed? how the Bones or the Cartilages were made? how Viſion and Hearing were performed? they anſwered, that the Stomack had a Chilifying faculty, and the Liver a Sanguifying faculty, that the Bones were formed by an Oſſifick faculty, and the Cartilages by a Cartilagineous; that the Eye ſaw by its viſive, and the Ear heard by its auditory faculty, and ſo of the reſt.

The Word *Faculty* no longer in uſe.

This was their general anſwer, by which they did evade, as well as by their occult qualities, all the difficulties that were propounded to them; inſomuch that Scholars were made no wiſer by their anſwers, than they were before. But now-a-days all theſe actions being explicated mechanically, I ſhall let you ſee, by demonſtrating every part exactly, that the action which each of them has, does abſolutely depend upon its ſtructure, being a neceſſary conſequence of its natural diſpoſition, ſo that it cannot do otherwiſe than it does.

To return then to the moſt rational Definition, that can be given of a Bone, I ſhall ſay that it is the hardeſt, and moſt ſolid part of the Body of an Animal.

The

The Differences that are observed in Bones, are taken from nine things, to wit, from their Substance, Quantity, Figure, Situation, Uses, Motion, Sense, Generation, and Cavities. Nine Differences of Bones.

The First Difference that is taken from their Substance, is because there are Bones which have a very hard Substance, as the *Tibia*; others less hard, as the *Vertebræ*; and others more soft and spungy, as the bone the *Sternum*. From their Substance.

The Second is taken from their Quantity, the number of which it is not easy to determine, because it is very great, and that all the Bones are not equal. For some are large, as those of the Arms and Legs; some more moderate, as those of the Head; and some small, as those of the Fingers. From their Quantity.

The Third is taken from their Figure, which is as different as there are Bones in the Body; some are long, as the *Femur*, or the *Tibia*; others short, as the Bones of the Wrist and the Heel; some round as the *Rotula*; others flat, as that of the Palate; others square, as the *Ossa Parietalia*, and some triangular, as the first Bone of the *Sternum*. Figure.

The Fourth is remarked from their Situation, because some are placed in the Head, others in the trunk of the Body, and others in the extremities. But we must observe, that among those of the Head, some have a deeper Situation, as the three *Ossicula* of the Hearing, and others a more superficial, as those of the *Cranium*. Situation.

The Fifth proceeds from their Uses, some serving to support the Body, as the Bones of the Thighs and the Legs; others to contain parts, as the *Costæ* that include the Heart and the Lungs, and others both to containand defend, as the Bones of the *Cranium*, in respect of the Brain. Uses.

The Sixth is known by their Motion, because some of them have a manifest motion, as the great Bones of the extremities; others a secret one, as those of the Wrist and the Heel; and some have no motion at all, as those of the Head. Motions.

The Seventh difference is easy to observe, because generally all the Bones have no Sensation except the Teeth. Sensation.

The Eighth is taken from the time of their generation and perfection, because some of them do grow to perfection, even from the Mothers Womb, such as the small Bones that lie in the Cavities of the Ear; and there are others which grow to perfection, with time and years, as do all the Bones of the Body. And of these Generation.

some do harden sooner, as the lower Mandible, and some later, as those of the *Vertex* or top of the Head.

From their Cavities. The Ninth and last Difference is taken from their Cavities; some have very large Cavities, for reception of the Marrow, as those of the extremities of the Body, and some have only porosities, which contain a medullary juice, as the *Calcaneum*. Again some of them have holes for transmission of the Vessels, as the Bone of the *Basis* of the *Cranium*, and the *Vertebræ*; others have only a hollowness, as the *Os Sternum*, and and some sinus's, as the *Ossa Frontis*, and *Temporum*; and lastly some consist of abundance of little holes like a Sieve, as the *Os Ethmoides*.

The Articulation of Bones exceeding wonderful. There is such an Art and Industry in Nature in the Articulations and Conjunction of the Bones, that the observation of them has been very useful to a great many Artists by way of Model, they knowing how advantageous it was to copy by so excellent an Original. And although there are almost as many different Articulations as you see there are Bones joined together, yet they are all necessary; for if all the Bones had been Articulated after the same manner, the Body could not have moved so conveniently as now it does. And now let us examine all these Articulations.

Bones joined by Articulation, or by *Symphysis*. *Galen* teaches us that all the Bones are conjoined, either by Articulation or by *Symphysis*. The first is a natural conjunction of two Bones, touching one another by their extremities; and the second is a natural union, or firm adhæsion, as when Bones that were at first plainly distinct, do seem to be grown altogether one Bone.

Two kinds of Articulation. There are two sorts of Articulation; one called *Diarthrosis*, and the other *Synarthrosis*. I doubt not but these Words will appear uncouth and barbarous: But because Anatomy and Surgery are fain to borrow the greatest part of their Terms of Art from the Greek, and it is difficult to find words in our Language, that are so proper for signifying the same things as they do, we become obliged to make use of them. Nevertheless I shall forbear using them as much as possible, though there is certainly much less difficulty in keeping to them, than in avoiding them. You will be of my mind if you will take the pains to understand them.

The Terms of Anatomy taken from the Greek.

What *Diarthrosis* is. The *Diarthrosis* is a kind of Articulation, in which the motion is manifest. It is divided into three sorts, *Enarthrosis*, *Arthrodia* and *Ginglymus*. *Enar-*

Enarthrosis is when a large and long Head is received into a deep Cavity, as the Head of the *Femur* is received into the Cavity of the *Os Innominatum*. C *Enarthrosis.*

Arthrodia is a kind of Articulation, wherein a superficial Cavity does receive a flat Head, as you see the Head of the *Humerus* is received into the *Glenoide* Cavity of the *Scapula*, or the Heads of the *Metacarpus*, or *Metatarsus* are received into the Cavities of the first *Phalanx* or rank of the Bones of the Fingers. D *Arthrodia.*

Ginglymus is a third sort of Articulation, in which two Bones do mutually receive one another, so that the same Bone does receive into it another, and is likewise received into the other, as the Bone of the *Carpus*, which is received into that of the *Os Cubiti*, and that of the *Os Cubiti* into that of the *Carpus*. E *Ginglymus.*

According to Authors, there are three sorts of *Ginglymus*; the first is, when the same Bone is received by another Bone, the which it does reciprocally receive, as we observed in the *Os Cubiti* and the *Carpus*. The Second is, when one and the same Bone does receive another at one end, and is received by another Bone at its other end, as you may observe in the *Vertebræ*, whereof one of them does receive its superior, and is received by its inferior *Vertebra*. The third sort is, when a Bone is received into another, like an Axel-tree in a wheel, as the second *Vertebra* of the Neck is received by the first. F Another *Ginglymus.* G A third *Ginglymus.*

Synarthrosis is an Articulation so firm and strong, that it has no distinct motion. It has likewise three sorts, the Suture, *Harmonia* and *Gomphosis*. What *Synarthrosis* is.

Suture is an Articulation where two Bones are so joined as if they had been sown together. There is a true and genuine, and a false or bastard Suture. The true Suture is, when two Bones are conjoined like unto two Saws, whose teeth meet close together, as the *Ossa Parietalia*, so called, with the *Os Coronale*. The false Suture is, when two Bones are articulated in form of Scales or *Laminæ* placed one over the other, as the *Parietalia* with the *Os Temporum*. I shall reserve the explication more at large of the other kinds of Sutures, to speak of in the following Demonstration, when I come to treat of the Bones of the *Cranium*. What's a Suture. H The true Suture. The false Suture.

Harmonia is an Articulation where the Bones are joined in a simple straight line, or a circular, as the Bones of the Face, the Nose, and the Palate. If we examine K *Harmonia.*

the Bones of the upper Jaw, we ſhall find their conjunction to be by ſmall toothings; but becauſe they are exceeding ſmall, and do not appear to outward view, as thoſe of the Sutures do, we are fain to diſtinguiſh *Harmonia* from a Suture, and ſo make this the ſecond kind of *Synarthroſis*.

L *Gomphoſis.* *Gomphoſis* is a compact Articulation, when one Bone is ſunk or driven hard into another, as a nail is into a piece of Wood, or rather as the Teeth are into their *Alveoli* or Sockets.

M M The Neutral Articulation. Another kind of Articulation is added to all theſe, and is called Neutral or Dubious, becauſe it is neither wholly a *Diarthroſis* as having no manifeſt motion; nor is it altogether a *Synarthroſis*, being not entirely deprived of motion. Such is the Articulation of the *Coſtæ* with the *Vertebræ* of the Back, and ſuch is that of the Bones of the *Carpus* and the *Tarſus*, among one another. This therefore partaking of both thoſe Articulations is called *Amphiarthroſis*, and according to ſome *Diarthroſis Synarthrodialis*.

Of *Symphyſis.* *Symphyſis*, which I have ſaid to be a natural union of Bones, is of two ſorts, either made without ſome intermediate Subſtance, or with it.

Symphyſis without *medium.* That which I call without ſome intermediate Subſtance is, when we find nothing at all that makes the union of the two Bones, as the *Epiphyſis*, or Appendage with the principal Bone to which it is adjoined; or as we obſerve in the Bones of the upper Jaw. This union is ſomething like that of a Tree, and its Graft which are ſo united together, that they both make but one Body: and thus Nature by hardning the Bones of the lower Jaw, and the *Epiphyſis*, thereto belonging, does ſo conjoin them, that they make one and the ſame continued Body.

Symphyſis with means. *Symphyſis* that is made with ſome intervening ſubſtance, is of three ſorts, *Synneuroſis*, *Syſarcoſis* and *Synchondroſis*.

Synneuroſis. *Synneuroſis* is that kind of *Symphyſis* which unites Bones by the means of Ligaments intervening; ſuch is the Articulation of the *Rotula* or *Patella*, with the *Tibia*.

Syſarcoſis. *Syſarcoſis* is that which joins Bones by the means of Fleſh, as the *Os Hyoidis* and the *Scapula*.

Synchondroſis. *Synchondroſis* is a third kind of *Symphyſis*, which unites two Bones together by means of a *Cartilage*, as the two Bones of the *Os Pubis*, or the Share-bone, where the

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the Cartilage does unite them ſo ſtrongly, that it is impoſſible to ſeparate them aſunder, even in Child-bed, as ſome have thought.

Bartholin allows of no *Synarthroſis*; he ſays that *Symphyſis* is only of two kinds, either without a *medium*, whereof three ſorts, *Suture*, *Harmonia*, and *Gomphoſis*; or with a mediate ſubſtance, which are alſo three, as *Synneuroſis*, *Syſarcoſis*, and *Synchondroſis*, as I have ſaid. Thus he differs little from others. *Bartholin's* Opinion.

You will obſerve, Gentlemen, upon finiſhing this Demonſtration, that *Symphyſis* is found to be in the three kinds of *Diarthroſis*, and that it is not in any of the kinds of *Synarthroſis*.

Of the BONES in General.

The SECOND DEMONSTRATION.

GEntlemen, What I am going to demonſtrate This Day, is not of leſs conſequence than what I ſhew'd you Yeſterday; ſince no Luxation can be reduced, unleſs we know how the Bones are Articulated; and ſince no Fracture, either Simple or Compound, can be healed, unleſs we know before-hand how the Bone is made, and what Parts it conſiſts of. The knowledge of the Compoſition of Bones, neceſſary.

When Wounds are made, either by Bullets, Granado's, or the like, partaking of Fire, or elſe by Falls, and cruel Blows, which do change the natural Oeconomy of the Part by the great havock and diſorder that is made in it, it becomes the prudence of a Surgeon to reſtore theſe Parts, as much as he can, to their former conformation, and to correct and amend (by the knowledge he has in his Art, and of the Parts that the Bone conſiſts of) the diſorders which ſuch misfortunes do uſe to cauſe. The Subject of this day's Demonſtration.

I told you yeſterday, that the Cauſes, the Parts, and the Number of the Bones were to be the Subject of this day's Demonſtration; but I have thought it proper to add to them the Cartilages and Ligaments in general, becauſe the Cartilages are not to be ſeparated from the Bones, and they differ from them only in more

more or leſs, and do often form the greateſt part of them: and the Ligaments do tie together and join them.

Laurentius's Opinion, that there are four Cauſes of Bones.

I begin with the Cauſes of Bones, which are reduced only to two, although *Laurentius* has comprehended four in his Definition, or rather in the Deſcription that he has given us of them. It is true, all the Philoſophers have acknowledged four Cauſes of every thing, to wit, the Efficient, Material, Formal, and Final: but beſides that theſe terms are now ſeldom uſed, it may be ſaid, that thoſe knowing Perſons underſtood better, than to think of comprehending all thoſe four Cauſes in a Definition, which ought to be ſhort and perſpicuous, in order to explain the nature of the thing defined, and its Compoſition by its Eſſential Parts. And 'tis certain, that it could not retain theſe Conditions, if it conſiſted of more than the *genus* and the difference, which are the Matter and Form of the Definition. So that to explicate the nature of Bones, it is needleſs to have recourſe unto four Cauſes, as *Laurentius* has done; ſince there are but two that contribute to their formation, the Seminal Liquor of the Egg, and the Heat.

A Definition muſt be ſhort and clear.

The true Cauſes of Bones.

Now ſince it is certain that the Sperm of the Egg (which is underſtood by the name of Liquor) ſerves for the Matter of Bones, it will be much the eaſier for you to conceive, that there is nothing requiſite but Heat to bring them to perfection, and rather than to amuſe your ſelves with ſearching out ſome *Idea*, or oſſifick faculty; otherwiſe you would be forced to multiply theſe faculties, and to make as many kinds of them, as there are different parts of the Body.

One and the ſame Cauſe ſerves to form all the Parts.

We muſt obſerve, That not only the Bones are made from the Seminal Liquor, but all the Parts which compound the Body; and this happens becauſe the Heat alone operating upon this Liquor, does unravel and ſeparate each Particle, which by taking the figure that it ought to have, by the peculiar diſpoſition of the Matter, does come to form an Animal.

But if it be objected, That it is hard to conceive how ſo many different Parts can be made from one and the ſame Cauſe: I anſwer, That the Sun which is but one principle of Heat, does produce very different Effects, according to the different Matters that it heats; for we ſee that it melts Wax, and dries the Earth. And

ſeeing

ſeeing theſe different Effects do proceed from the Matter on which it acts; ſo we ought to conceive, that the natural Heat acting upon the Liquor of the Egg, does diſengage and ſeparate each particle, and puts into motion thoſe which make the Blood, at the ſame time that it dries and hardens thoſe which conſtitute the Bones.

We know then but only two Cauſes of Bones, to wit, the Material, which is the Liquor of the Egg; and the Formal, which is the Heat: and we do not know what the word Faculty, or Oſſifick Vertue do mean. And furthermore to deſtroy this Opinion of *Idea* of him that ingenders, and to make it appear that this has no part in the buſineſs of Generation, although ſome Authors do make it be a Cauſe in the Formation of Parts; we need only to reflect on what does happen, when the Eggs of different Animals are put to brood under one and the ſame Fowl: If you put together Duck-Eggs, and thoſe of Hens and Partridges, you will find that one and the ſame Heat will produce Ducklings, Partridges and Chickens. And yet if we could penetrate into the *Idea* of the Hen that hatches them all, we ſhould find, that ſhe had no intention to breed any other than Chicken; but the Matter which is included in the Eggs, is the Principle on which the different Effects which follow do depend.

Experiments to prove it.

I ſhall ſay nothing of the Final Cauſe; it is to no purpoſe to diſcourſe of it here for your explanation; and you will ſufficiently underſtand what each part does, when I ſhall ſhew you how it is made. I ſhall only tell you, That the Final Cauſe has been the Subject of a great Diſpute between two famous Phyſicians of the Faculty of *Paris*, both very eminent Anatomiſts; one was Monſieur *Creſſé*, who making Anatomical Lectures at the *Phyſick-Garden*, in the place of Moſieur *de la Chambre*, firſt Phyſician to the Queen, and Profeſſor of Anatomy there, did maintain, That when we ſpeak of any Part, we ought to aſſign its End, becauſe it is certain that every one has its End; and that God having made nothing uſeleſs, we ought, when we ſhew any part, to ſay it was made for ſuch or ſuch an Action, ſince it has ſuch an Action: for Example, that we may certainly ſay, that the Eye was made for ſeeing, the Hand for taking, the Foot for

Different Opinions on the Final Cauſe.

for going, and so of the rest. Monsieur *Lamy*, on the contrary, pretended, That it was not our part to determine of the End, for which a part was made; That it was true, the Author of Nature had made nothing in vain, and that he had given some End to every thing that compounds a Humane Body: but when we do undertake to assign their several Ends, we do run a risque of imposing upon our selves, because Nature may have intended some other than that which we assert; and that therefore we ought never to say this Part has been made for that purpose, but that this part does do so and so. He granted that the Eye saw, the Hand did take a thing, that we did go with our Feet; but he maintained, that it was not fit for Man to pretend to penetrate into the secret Intentions of God, that it was his Duty only to admire his Works, it not being impossible but God might have purposed other Ends in what he has made, than such as we perceive; and he added, that to know a part well, it was not necessary to maintain that it was made for such Uses, that it was our business to examine it well, and to extricate and unfold all the parts of its Composition; and that then we should find that the Action, which it has, is a consequent of its texture, and that consequently we ought not to say the Eye was made for Seeing, but that we do See with the Eye. This was the Subject of their Dispute, which grew to be so warm, that they both did make on purpose Discourses in Publick for maintaining each their own Opinion; they both had their Parties, or Followers, but the greatest number was for Monsieur *Lamy*.

The Parts of Bones.

Bones are composed of many Parts, of which some are prominent, and others hollow. Of the first there are three sorts, as the principal part, the *Apophysis* and the *Epiphysis*. There are also three sorts of Cavities in them, and called either Holes, Pits, or *Sinus's*.

The Principal part of a Bone is the hardest and strongest part of it; it is call'd Principal, because it contains almost the whole integral Bone, and this retains the name of the whole to it self, having no other particular name; it is this, for Example, which makes the far greatest part of the *Femur*, as you see, and which possesses all the middle, even unto the extremities, where lie the *Apophyses* and *Epiphyses*, which are to be considered.

A The Femur.

Apophysis

Apophyſis is a protuberance that riſes on the ſuperficies of the Bone, with which it has the very ſame continuity; ſuch is that prominence you ſee on the *Os Petroſum*, called *Apophyſis Maſtoides*. The inequalities of Bones do ſerve to render their articulation more convenient, for the origination and inſertion of divers Muſcles, and for the defence of ſome parts, as are thoſe of the *Scapula* and the *Vertebræ*. An *Apophyſis*, what. B *Apophyſis Maſtoides.*

Epiphyſis is an appendage or additional Bone, joined to the Principal by a ſimple contiguity; ſuch is that prominence you ſee on the *Os Tarſi*. C *Epiphyſis* of the *Os Tarſi.*

Authors have aſſigned two Uſes to the *Epiphyſes*; the firſt is, to ſtrengthen the Articulations, becauſe the *Epiphyſes*, which are ſituated at the ends of the Bones, do ſerve for props, or a *baſis* to them, being of larger extent than the Bone it ſelf, and are thereby articulated the better. Their ſecond Uſe is, to ſerve, as well as the *Apophyſes*, for the inſertion of divers Muſcles and Ligaments; becauſe being of a leſs ſolid ſubſtance than the Principal Bone, and being harder than the Ligaments, they are of a middle nature between both, and conſequently do render more eaſie the adhæſion of the Ligaments; for you know that there is no Articulation made, where there are no Ligaments; and that theſe Ligaments do adhere more eaſily to the *Epiphyſes*, which are of a ſoft ſubſtance, than they do to the Bones, which are harder. The Uſes of *Epiphyſes.*

All *Epiphyſes* are like one to another; and it is obſerved that they differ four ſeveral ways, in Figure, Quantity, Number, and Situation. Differences of *Epiphyſes.*

They differ ſo in Figure, that the view does eaſily diſtinguiſh them. And they are reduced into three kinds, the Head, the Neck, and the *Corona*.

When a Bone terminates or riſes in a great round bunch, it is truly call'd the Head, as is that of the *Femur*; but if it be a ſmall prominence, it is call'd *Condylus*, ſuch as is that of the lower-Jaw, which enters into the cavities of the *Os Petroſum*, in order to join them together. D Head. E *Condylus.*

The Neck is the narroweſt part of the Bone, but from a narrow beginning does dilate it ſelf by little and little. It is always placed under a Head, as you may ſee one under the Head of the *Os Femoris*. It is obſervable, that the Head and the Neck do differ from one another, in that the Head is almoſt always *Epiphyſis*, and the Neck *Apophyſis*. F Neck.

The

G *Corona.* The *Corona* is when a Bone has a ſharp prominence. Theſe ſharp prominences have divers figures, and are called by the names of ſuch things as they do moſt reſemble. There is one in the *Os Petroſum*, called *Styloides*, becauſe it is made like a Styletto; another *Maſtoides*, becauſe it reſembles a Nipple; another *Corocoides*, placed in the *Scapula*, and ſo called from reſembling the Beake of a Raven; and laſtly, thoſe of the *Os Cuneiforme*, called *Pterygoides*, becauſe they are like the Wings of a Batt. *Corocoides.*

The magnitude of *Epiphyſes* is not alike in all the Bones; the *Tibia*, for Example, which is a large Bone, has large ones; and the ſmall Bones, as thoſe of the Fingers, have very ſmall appendages. Alſo you may ſee one and the ſame Bone to have *Epiphyſes* of a different bigneſs, as the *Femur*, has a large one call'd the Great *Trochanter*, and another ſmall one called the Leſſer *Trochanter*.

H The Great *Trochanter.* The Little *Trochanter.*

Number of *Epiphyſes.* The Number of *Epiphyſes* is not alike to every Bone; ſome have none at all, as that of the lower Mandible; and others have many. The *Coſtæ* have each one, the Bones of the Leg and the Arm have each two, thoſe of the *Os Ilium* three, thoſe of the *Femur* four, and each *Vertebra* has five of them. In the Bones we do find the moſt of them.

Situation of the *Epiphyſes.* The Situation of the *Epiphyſes* is different, in that they are not all placed at the extremities of Bones, but ſome are found in the middle of them.

Subſtance of *Epiphyſes.* Beſides theſe four Eſſential Differences we have taken notice of in *Epiphyſes*, there ſtill remains one, which comes by age, which does make their Subſtance more or leſs hard; in Infants it is Cartilaginous, but it hardens according as they advance in years, and it does not come to be perfectly turned into Bone until after the twentieth year of their age: a thing that I have obſerved in the making of a Skeleton of a Youth eighteen years old, all whoſe *Epiphyſes* did ſeparate from the Bones, by Ebullition, or boiling.

Cartilages of *Epiphyſes.* We may obſerve once more, that the *Epiphyſes*, at their extremities, are covered with a Cartilage, that facilitates the motion of the Joints; and beſides this Cartilage that was neceſſary for hindring the Bones from rubbing, or grating againſt one another, Nature has likewiſe provided a ſlimy Humour in all the Joints, which having the ſame effect as Greaſe has in Coach-Wheels,

Wheels, does hinder, in conjunction with the Cartilage, that the extremities of Bones do not waste and heat one another in their continual motions.

The hollow parts of Bones are, as I have said, of three sorts; they have a Hole, a Pit, and a *Sinus*. The Cavities of Bones.

A Hole is a cavity that has both ingress and egress; as may be seen in the cavities that are at the *basis* of the *Cranium*, whereof some give an entrance to the Arteries, and others do let the Nerves and Veins go out. Likewise that great Cavity we see in the *Os Ischii* is called a Hole. K A Hole.

A Pit is a Cavity that has an Entrance, but no passage out, and whose brims are raised by small prominencies like little hills: these Cavities do serve to give a part some figure, or else to contain somewhat in them; such is the Cavity of the Orbite that contains the Eye. L A Pit.

A *Sinus* is a kind of Cavity in a Bone, whose Orifice or Entrance is very narrow and the Bottom large; these *Sinus's* are found in the *Basis* of the *Os Coronale*, and the Ancients thought their use was to make these Bones more light, which I do not believe. I shall forbear to tell you my thoughts thereupon, untill I come to shew them. M *Sinus*.

Besides these three kinds of Cavities that I have explained, there are still some others that are divided into Internal and External.

The Internal are two, either great and apparent, such as are those along the great Bones, which contain the Marrow; or little and porous Cavities, such as are those in the *Vertebræ* and *Epiphyses*, which do contain a Medullary juice. Internal Cavities.

The External are of three sorts, either great Cavities incircled with thick brims, and are called *Cotyla* or *Cotyloides*, from the name of an old measure among the Antients, such is that of the *Os Ischium* that receives the Head of the *Femur*; or moderate and less deep Cavities, and called *Glenoides*, such as that of the *Scapula*, which receives the head of the *Humerus*; or else little and flat, such are those at the ends of the Bones of the first rank of the Fingers, which receive the heads of the Bones of the *Metacarpus*. External Cavities. N The *Cotyloides*. O The *Glenoides*. P Small Cavities.

These Cavities are simple or double; the first sort do receive only one head, as that of the end of the *Radius*; and the double ones do receive two, as does that which Q Simple Cavities.

receives

Double Cavities.

R receives the end of the *Tibia* from above, and those of the Bones of the two last ranks of the Toes. They are likewise of a different figure; some of them are like unto a Pully, as those of the lower extremity of the *Humerus*, which do receive the *Os Cubiti*; others like to a Half-moon, as those of the upper part of the *Cubitus*, and so of the rest.

Uses of the Circular Ligament.

All these External Cavities, that serve for Articulation, have every one of them an Eminence on their circumference, that may be called a Lip, or Brow, to which is tied a circular ligament, which including the head of the Bone that they receive, does serve to strengthen the Articulation, and to hinder Luxations, which would often happen if such Ligament were not there.

Four things remarkable in Bones.

It remains for me to shew you the Number of the Bones, for finishing this general head; but before I do it, it will not be improper to observe to you four things, the Magnitude, the Colour, the Nourishment, and the Sensation of Bones.

Magnitude.

All Bones are not of the same bigness in Bodies, I do not mean only in those of men of different stature, but even in persons of the same height; for it happens often that among these last, some have their Bones smaller than others: And if Beauty does depend on the slenderness of the Bones, they may be said to have the best shape who have the smaller. And indeed it is one of the reasons why Women are commonly handsomer than Men, because the Bones of their Face are more curious and small than those of the Men: and this makes us able to distinguish easily the Skeleton of a Woman from that of a Man. But besides there is a very great difference between the one and t'other, in that the *Os Ilium* is in men lesser and straiter, whereas in Women it is more expanded in order to form that capacity where the *Fœtus* is to lie; and hence it is that Women having their *Os Ilium* more outward, and their *Os Sacrum* more backward, have their Hips and Buttocks larger than Men.

We may also observe the magnitude of Bones, according to mens different Ages: for they do grow and magnify from the Birth to the twentieth year, or thereabouts; and from twenty to threescore they continue of the same bigness; but after threescore they still decline or decrease; which does happen because the

the bony fibres grow dry, and waſt, and come cloſer together.

The Colour of Bones is not alike in all; ſome are very white, others leſs white, and ſome are of a greyiſh colour; and it is ſo true that the diverſity of theſe colours does depend upon the firſt matter of which the Bones are formed, that though we take the ſame pains to whiten two or three Skeletons, yet we can never make all of them alike white. Colour.

It has been thought a long time, that the Marrow, and the *Succus Nutritius* did ſerve the Bones for Nouriſhment, but the Diſcoveries which have been made of their other Uſes, have proved that the Bones were nouriſhed by Bloud, as well as the reſt of the Body. It is true the Marrow may ſerve to humect them, as Fat does ſoften the Parts, but it is not their true alimentary juice, ſince there is nothing to be found but in the Bloud, which, by circulating in the Subſtance of Bones, is able to bring them ſuch Particles as are proper for their Nouriſhment, as it does to all the other Parts; the which may alſo convince us that Bones are not nouriſhed by appoſition of matter upon matter, as Stones are formed, but by a Liquor which by inſinuating into their Pores, does increaſe their bulk: for there is a vaſt number of *Ductus* in the body of Bones (like unto thoſe in the Trunks of Trees, that convey their juice) through which the Nouriſhment is conveyed by means of the Arteries and the remaining ſuperfluity returning through the extremities of theſe *Ductus*, is received by the little Veins, which carry it back into the maſs of Bloud. Moreover it is eaſy to perceive in uſing the Trepan, that there is Bloud between the two Tables of the *Cranium*, and that if you break the Bone of an Animal newly killed, there will come forth of it ſome little drops of Bloud: which leaves no room to doubt but that ſome Bloud does enter into the Bones. Nouriſhment.

Marrow is always found, not only in the Bones of Men, but of all other Animals. It is true there are Times when they are full of it, and other Seaſons when they are without it; but it is an error to think the Moon does cauſe either the increaſe or decreaſe; the diminution of it is rather an effect of ſome diſeaſe, ſome fatigue, or of ſome great abſtinence. And ſince we ſee the Fat of Men to conſume after a Diſeaſe, great Labour, or Abſtinence, we may conclude, that All the Bones contain a Marrow.

the Marrow does likewiſe waſt and conſume by one of thoſe three cauſes, ſince Marrow is to the Bones, what Fat is to other parts of the Body.

Senſation. Indeed Bones have no Senſation, but they are covered with the *Perioſteum*, which is a very ſmall and very ſenſible Membrane. Thoſe that are ſubject to the Gout, or who have had any Operation made on their Bones, can give us a certain Aſſurance of it, ſince the pains they feel during theſe Operations are very great, when this Membrane comes to be cut.

The Number of Bones in all the Body. The Number of Bones, which is the ſixth and laſt thing to be conſidered of the Bones in General, is very great. In the firſt Denomination, I have ſhewn you the fore-part of a Skeleton, and in this I ſhall give you the Side of this great Skeleton, and the hinder-part of this little one, that you may have a full View of it on all ſides. You muſt not wonder, when you find it to conſiſt of ſo many Bones, even to the Number of two hundred forty and nine, in the whole. For Example, there are reckoned be in the Head threeſcore, in the Trunk of the Body threeſcore and ſeven, in the Arms and Hands threeſcore and two, and juſt ſixty in the Thighs and Legs. If the Author of Nature had formed fewer in the Hands, do you think the Hands could have taken things as they now do? If the Spine had not conſiſted of ſo many *Vertebræ* as it does, could it have bent as it now does? and laſtly if the Leg, and the Thigh, had been but one Bone, could a man have Walked ſo conveniently as now he does? It was therefore neceſſary, that the Number of Bones ſhould be ſo great as it is, for the perfection of his Body and the performance of his Functions.

A great Skeleton ſhewn on the Side of it.

A little Skeleton viewed behind.

Threeſcore Bones in the Head. Of threeſcore Bones in the Head, there are fourteen of them in the *Cranium*, and forty ſix in the Face, reckoning among them the *Os Hyoides*; the fourteen belonging to the *Cranium*, are the *Os Coronale*, the *Os Occipitis*, the two *Bregma's* or *Parietalia*, the two Temporal, the *Os Ethmoides*, the *Sphœnoides*, and the ſix auditory Bones, or the *Incus*, *Stapus*, and *Malleus*, on each ſide. Of forty ſix that are in the Face, there are ſeven and twenty of them in the upper Mandible, the Cheek-bone, the Nail-bone, the Maxillary or Jawbone, the Bone of the Noſe, and that of the Palate, and the ſame Number on the other ſide; the eleventh, which is ſingle, having no fellow is in French called *le*

vomer

vomer, being like the Coulter or Share of a Plough; and there are ſixteen upper Teeth, eighteen in the lower Mandible, to wit two Bones and ſixteen Teeth, adding to all which the *Os Hyoides*, there will appear to be threeſcore in the Head.

Sixty-ſeven in the Trunk of the Body.

Of ſixty-ſeven in the Trunk of the Body, there are two and thirty of them in the Spine, and nine and twenty in the Breaſt. Thoſe of the Spine are ſeven in the Neck, twelve in the Back, five in the Loins, five in the *Os Sacrum*, and three in the *Coccyx* or Rump-bone. Thoſe of the Breaſt are the four and twenty Ribs, the two *Clavicles*, and three in the *Sternum*. There are likewiſe ſix *Oſſa Innominata*, which are the two *Ilia*, the two *Iſchia*, and the two *Oſſa Pubis*. Their whole Number makes ſixty-ſeven in the Trunk of the Body.

Sixty-two in the Arms and Hands.

Of ſixty-two that are in the upper Limbs, each Arm and Hand has one and thirty, which are the Shoulder-blade, the *Humerus*, the *Cubitus*, the *Radius*, eight in the Wriſt, four in the *Metacarpus*, and fifteen in the Fingers; and the ſame Number in the other Arm, which makes ſixty-two.

Threeſcore in the Legs and Feet.

Of threeſcore in the lower Limbs, there are thirty in each, as the *Femur*, the *Rotula*, the *Tibia*, the *Fibula*, ſeven in the *Tarſus*, five in the *Metatarſus*, and fourteen in the Toes; and the ſame on t'other ſide, in all, ſixty.

Two hundredforty-nine in the whole Body.

This Number of Bones might be increaſed, if we would make ſeveral of the *Os Hyoides*, or would add to them the *Seſamoides*. Likewiſe the Number would be leſs, if we ſhould reckon the two Bones of the lower Mandible to be but one, and if we ſhould make but one Bone of the *Os Sacrum* inſtead of five. But ſince we ought to keep to ſome determinate Number, I ſhould adviſe you to ſtick to that of two hundred and forty-nine, which is the moſt univerſally received among all Authors.

The Cartilages ought to be known.

Although the Cartilages and the Ligaments become ſeparated from the Skeleton by boiling, nevertheleſs our Oſteology would be imperfect, if we ſhould paſs them by in ſilence, and if I ſhould not inſtruct you in what ought to be known of them in general, reſerving to treat of each of them in particular, in their proper place of my Anatomical Demonſtrations.

The Cartilages, what.

The Cartilages are the hardeſt of all parts, next to the Bones, they are almoſt of the ſame nature, and do differ only in the more or leſs. There are three ſorts of them, ſome are hard and become quite bony with time, as thoſe do which make the *Sternum*, and thoſe that tye the Appendages to the Principal Bone; others again are ſofter and contribute to the compoſition of the parts, as do the Cartilages of the Noſe, the Ears, the *Xiphoides*, and that of the *Coccyx*; and laſtly ſome are very ſoft, and are of the Nature of Ligaments which has made them be called Ligamentary Cartilages:

Figure of the Cartilages.

There are Cartilages of divers figures, and they have obtained the name of thoſe things that they reſemble; one is called Annular, becauſe it is like unto a Ring; another *Xiphoides* or *Enſiformis*, becauſe its figure is like the point of a Sword; another *Scutiformis*, ſhaped like to a Helmet, and ſo of divers others. They commonly aſſociate with the Bones, yet there are ſome that do not touch together, as thoſe of the *Larynx*, and the Eye-lids.

The Cartilages are inſenſible,

Cartilages have no Senſation, conſiſting neither of Membrane, nor Nerve; which is ſo much the better for Men, ſeeing they have parts enough that are ſubject to Pain, without the addition of theſe, which would occaſion continual Pains in the motions they are fain to make. They have no Cavities and conſequently no Marrow in them: but in defect of that they have a mucoſity of a viſcous and flexible Subſtance that preſerves and keeps them.

The Uſes of them.

The Uſes of the Cartilages are to hinder the Bones from hurting one another by a mutual colliſion; to join them together in divers places by *Syncondroſis*, and to contribute much to the better ſhape of many parts, as do thoſe of the Noſe, the Ears, the *Trachæa*, the Eye-lids, and ſome others.

No Ligaments left in this Skeleton.

All the Bones which you ſee in this Skeleton, could not be kept faſtned together if they were not conjoined by Ligaments; but I have already told you, that ſince they have been ſeparated from the Bones by boiling, a Wire ſerves inſtead of them, and Cork ſupplies the Cartilages of the *Sternum*. Nevertheleſs it were not impoſſible to preſerve a Skeleton with the Cartilages and Ligaments upon it, by taking away the Fleſh only; but take what care we will, the Worms would breed in it, and we could never be able to keep

keep such a one, either so well, or so long as I have done this.

A Ligament is of a solid and white Substance, it is softer than the Gristle, and harder than a Nerve or Membrane; it has neither Cavity, nor Sense, nor Motion, which makes it to suffer Pain no more than the Cartilage. A Ligament, what.

Ligaments are made as the rest of the parts, of the Sperme or seminal liquor of the Egg; some of them are strong being placed within between the Bones, some thick and round, called Cartilaginous Ligaments, and some thin and of a membranous nature, which do outwardly cover the Bones. The Matter of Ligaments.

They are of divers Figures; some large, called Membranous, and others round or Nervous: These Names are given them, for the resemblance they have to Membranes or Nerves, and not because they are in reality either Membranous or Nervous. Their Figure.

The only and true Use of Ligaments, is to tie, like a Cord, the Parts of the Body, and chiefly the Bones, which they do keep joined and united together, and hinder them from falling out of their places. Their Use.

I shall finish this Demonstration, by saying two words concerning the forming of *Callus*. You know, we call *Callus* that knot which joins together a fractur'd Bone. It is made after this manner: The Juice which nourishes the Bones sliding along the bony Fibres, does give, or sweat, towards the place where these Fibres were broke asunder; and stopping or gathering together about the two ends of the fractur'd Bone, it there becomes dry, and unites them like a strong Glew, insomuch that afterwards there remains only a small inequality in the place where the *Callus* is formed. How *Callus* is made.

Thus, Gentlemen, you have what I intended to Demonstrate to you This Day: To Morrow I shall entertain you with discoursing on all the Bones in particular, beginning with those of the Head.

Of the HEAD *in General.*

Of the Bones of the *Cranium.*

The THIRD DEMONSTRATION.

TO give an Account of the Bones with ſome Order, as I promis'd you, Gentlemen, we muſt divide the Skeleton into the Head, the Trunk of the Body, and the Limbs.

We ought to begin with the Head.

Although Authors do not agree among themſelves, with what Part of the Skeleton we ought to begin, provided they be all known; nevertheleſs, I cannot but think we ought to begin with the Head, becauſe it appears firſt to our view, and becauſe it is the nobleſt and moſt conſiderable part of the Body.

The admirable Structure of the Head.

I ſhall not here make any *Elogium* on the Brain, reſerving that to its proper time, in the progreſs of my Anatomical Demonſtrations: I will only obſerve to you, That the Bones which compoſe the Head are not of ſo ſmall conſequence to the Brain it ſelf, but that it receives conſiderable advantages from them, ſince they do make a manſion for the Brain, and are a rampart or fortification to it againſt external injuries.

Definition of the Head.

We do underſtand by the Head, all that lies between the *Vertex* and the firſt *Vertebra* of the Neck, comprehending in it both the Skull and the Face. *Hippocrates* conſiders it as the *Domicilium*, or Dwelling-houſe of the Brain, and defines it to be a Bony part, conſiſting of two Tables woven together with the *Diploe* between them, and covered outwardly with the *Pericranium*, and inwardly provided with the *Dura Mater*.

Its Subſtance.

You'll obſerve, that the Subſtance of the Head is altogether Bony, in which it differs both from the *Thorax* and the *Abdomen*, one of them being wholly fleſhy, and the other partly bony and partly fleſhy. This ſo ſolid a Subſtance is of great help to it, not only for containing the Brain, that has need of ſo ſtrong an incloſure, but alſo to defend it againſt all injuries.

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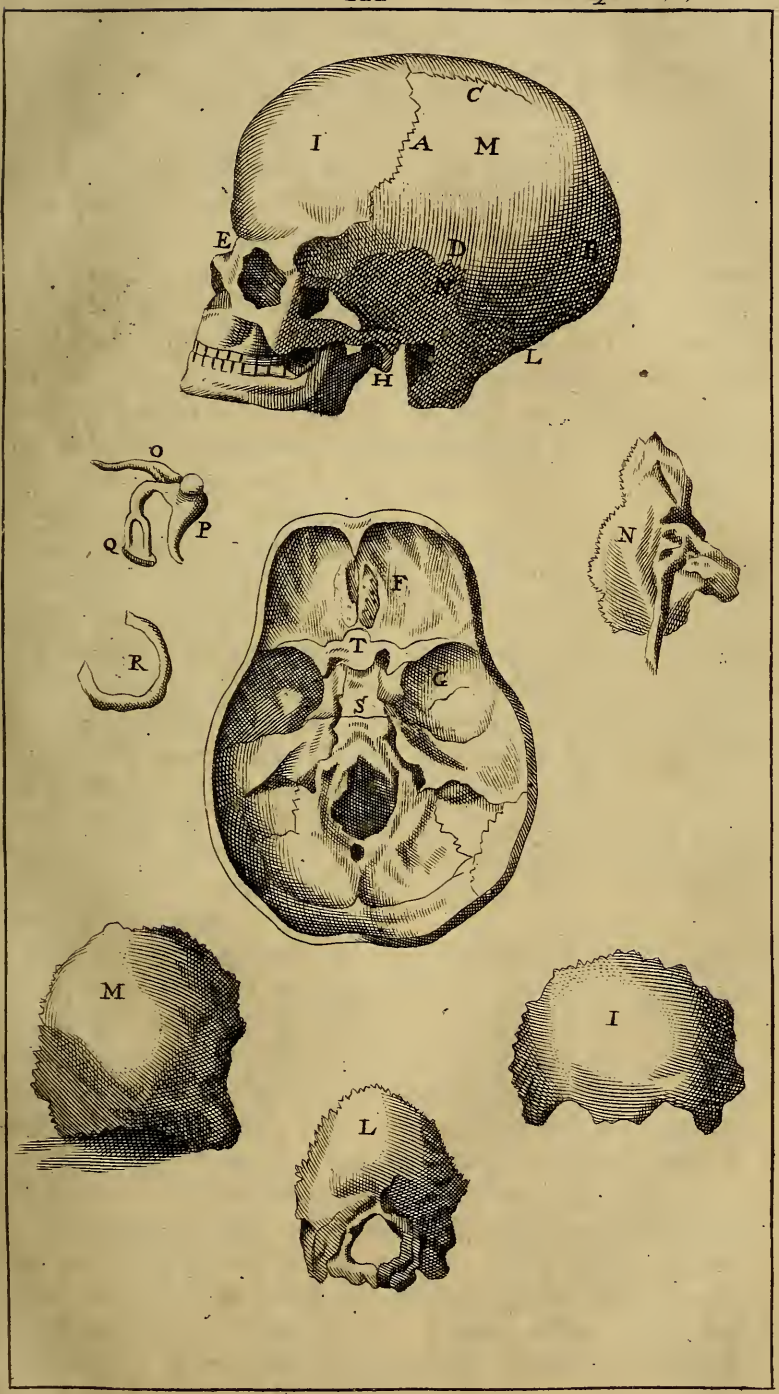
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The Head is the moſt eminent Part of the Body; but the Reaſons that many Authors give for its high Situation, does not ſeem probable to me. They ſay, it is for the ſake of the Eyes that are therein placed; and that their action being to ſee and diſcover all things, they ought to be placed in the higheſt part of the Body. But it is a better Reaſon, to think that the Brain being to tranſmit the animal Juice through the Nerves to all the parts of the Body, for their motion and their ſenſation, it could not ſo do more conveniently than from on high downwards, the impulſe of it being more eaſie after this manner than from below upwards, ſince the Brain is of ſo ſoft a ſubſtance as it is. And here the Brain may be compared to a River or Pond that ſupplies Water to ſeveral Fountains; this is always placed in the higheſt part of a Garden, for the more convenient communication of the Water, which it would not be able to do, if it were ſituated lower than the Fountains. Its Situation.

The Magnitude of the Head ought to be proportionable to that of the Brain, ſince it is made for the ſake of it. There are ſome of them very great, and others very ſmall, and both do denote a fault in their conformation. The great Heads are ſubject to abundance of defluxions and inconveniencies, and the ſmall ones have a tendency to folly, the Brain being in theſe ſtreightned in its functions: nevertheleſs, it ſeems more deſirable to have the Head encline rather to largeneſs than ſmalneſs; for it is obſerved, that thoſe who have large Heads have a great deal more Senſe than the ſmall ones. Magnitude.

The natural Figure of the Head is Round, and a little flatned on the ſides, for the better containing the Brain, and for its eaſier motion. It is Oblong both before and behind, for yielding the more room both for the Brain and the *Cerebellum*. If it were not flatned on the ſides, but were abſolutely round, the Temples would have been too much expoſed, and it would not have had ſuch an *æquilibrium* as it has. Figure.

There are Heads of a depraved and preternatural figure; in ſome the protuberance before fails, and in others that behind, and in others again there is no prominence on either ſide. Thoſe that have the misfortune to be like a Sugar-loaf, have not a Brain well regulated in its functions.

Uſes of the Head.

The Uſes of the Head are conſiderable; for beſides its particular or proper ones to contain and to defend the Brain, it has likewiſe the common uſe of all the Bones to ſerve for the adhæſion of many Muſcles.

Diviſion of the Head.

The Head is divided into two parts, of which one is covered with Hair, call'd the *Cranium*; Skull, or Scalp; and the other without Hair, call'd the Face.

The Bones which do conſtitute theſe two parts are ſufficiently numerous and conſiderable, to employ us for two Demonſtrations. Wherefore I ſhall begin with thoſe of the *Cranium*, and end with thoſe of the Face.

The *Cranium*, what.

The *Cranium* comprehends the Bones which do contain the Brain and the *Cerebellum*. It is divided into two Tables, which are like two *Laminæ* laid one upon the other, between which there is the *Diploe*, or a a medullary Subſtance, which is full of little Cells of a different bigneſs that receive their little Arteries from the Brain, and tranſmit the little Veins into the *Sinus* of the *Dura mater*. It is between theſe two Tables that the Blood is lodged which nouriſhes the *Cranium*; and it is this ſame Blood that is ſeen to drop forth in the Operation of the Trepan, when the firſt Table of the Bone is bored through.

The Outward part of the *Cranium*.

The External and Superiour Superficies of the *Cranium* is ſmooth and poliſh'd; but the Inferior is very rough and unequal, by reaſon of the many proceſſes and appendages that are found in it.

The Inward part.

Its Internal and Superior Superficies is in like manner ſmooth and equal, excepting ſome little channels that are made in it by the Veſſels that creep upon the *Dura mater*, when the *Cranium* is ſtill moiſt and cartilaginous; but it has its Internal and Inferior Superficies unequal, by reaſon of the productions and cavities that are found in it.

The Holes of the *Cranium*.

The *Cranium* has many Holes that are of a different bigneſs, they do give paſſage to the *Medulla Spinalis*, to the Nerves, Arteries and Veins, which fill up theſe Holes; and which fill them ſo exactly, that neither Vapours nor Fumes can come into them, nor go through them, but by means of the Veſſels themſelves. I ſhall ſhew you all theſe Holes, when I demonſtrate each Bone in particular.

As to the Doubt that ſome have to judge whether the *Cranium* does cauſe the Largeneſs of the Brain, or the Brain cauſes the Largeneſs of the *Cranium*, it is eaſie to conclude, that the Bigneſs of the *Cranium* does depend on that of the Brain, for two reaſons: The firſt is, That the Matter which encompaſſes the Brain, and is to form the *Cranium*, does extend more or leſs, according as the Brain is greater or leſſer: And the ſecond is, That the *Cranium* is not formed till after the Brain. Which is ſo true, that we ſee in an Infant newly-born the Brain is in its perfection, when the *Cranium* remains only cartilaginous and but half-bone about the Sutures, and in the middle and ſuperiour region of the Head, that is called the Fountain, and which grows not into perfect Bone, but after ſome years. Hence it is, that in the Labours of Women, theſe Bones not being yet hard, they give back and yield a little to compreſſion, to help the Delivery of the Infant. That the Brain gives the Head its Magnitude.

Nevertheleſs, the Moderns are divided hereupon: For ſome do pretend, that Nature forming at the ſame time all the Parts of a Body, it can never be decided, whether it be the Brain or the *Cranium* that communicates its figure the one to the other, ſince it often depends on the motions which happen in the formation of the *Fœtus*, either naturally, or by accident.

The *Cranium* is compounded of many Bones, diſtinguiſhed by the Junctures, called Sutures. The Bones of the *Cranium*.

After having given the Definition of Sutures, and of ſome of its kinds, when I treated of *Synarthroſis* before, it will ſuffice to divide them here into Proper and Common Sutures. The Proper are thoſe that ſerve to divide only the Bones of the *Cranium*. They are True or Falſe. The Sutures.

The True Sutures are thoſe that are indented together like the Teeth of a Saw. We muſt alſo obſerve, that there are ſmall pieces of Bone which enter into one another, but are not edged like the Teeth of a Saw, but made like unto the Tail of a Swallow, which encloſes them together, and hinders them from dividing and ſeparating. They are three, the Coronal, the Lambdoide, and the Sagittal. The True Sutures.

The Coronal is that on the fore-part of the Head; it is ſo called, either becauſe it is ſituated in the place where formerly Crowns were worn, or elſe becauſe it has The Coronal Suture.

has a circular figure; it extends from one Temple to the other, and joins the *Os Frontis* with the two Bones of the *Sinciput*.

The Lambdoide. The Lambdoide is so called, because it is made like a Greek Λ: it is opposite to the former; it unites the *Os Occipitis* with the two Bones of the *Sinciput* behind.

The Sagittal Suture. The Sagittal Suture is so call'd, because it is strait like an Arrow, that is in Latin, *Sagitta*. It is placed in the superior part of the Head; it goes from the Coronal to the Lambdoide, and joins the two Bones of the *Sinciput* in their uppermost part. This Suture does sometimes descend to the root of the Nose, and then it divides the *Os Frontis* in two parts, the which it also does in the *Os Occipitis* in some Bodies. These three Sutures are sometimes so strongly united in Old People, that they do seem to be but one entire piece.

The False Sutures. The False Sutures are those that are joined together like the Scales of Fish, and they are called *Squammosæ*, or Skaly; they are two, one on each side; they do join the superior and smaller parts of the *Os Petrosum* with the *Parietalia*, or Bones of the *Sinciput*.

D *Squammosæ.*

Those are called Common Sutures which do separate the Bones of the *Cranium* from those of the Face: They are four, the Transversal, Ethmoidal, Sphœnoidal, and Zygomatick.

E Transversal Suture. The Transversal is so called, because it traverses the Face from one side to t'other: it begins at one of the small angles of the Eye, and passing by the bottom of its orbit, by the root of the Nose, it finishes its course at the other little angle: It is this which separates the *Os Coronale* from those of the Face.

F Ethmoidal Suture. The Ethmoidal turns round about the *Os Ethmoides*, and does separate it from the Bones that touch it.

G Sphœnoidal Suture. The Sphœnoidal is so called, because it encompasses the *Os Sphœnoides*; it separates it from the *Os Coronale*, the *Os Petrosum*, and the *Os Occipitis*.

H Zygomatick Suture. The Zygomatick is so named, because it is placed wholly in the *Zygoma*; it is very small, and separates the *Os Petrosum* by its process from the Cheek-bone. These Sutures are not so apparent as the former; and we must observe them very near, to see the little pieces of Bones that fall into their intermediate spaces.

The Uses of Sutures. The Uses of Sutures are reduced to three principal ones; the first is for the adhæsion of many small threads

threads of Ligaments, which tie the *Dura-mater*; the ſecond is to give paſſage to the Veſſels, which go in and come out of the *Diploe*; and the third is to help perſpiration: For it is not likely that theſe Sutures were made only to hinder the fracture of one Bone of the *Cranium* from affecting another: It is true, they do ſo; but that this ſhould have been the chief deſign of Nature can never be maintained, no more than to ſay the appendages were made to hinder the fracture of Bones being communicated to the Joints.

An Obſervation in Sutures that are too compact, or cloſe.

It has been obſerved, That thoſe who have their Sutures of the *Cranium* too much cloſed, are ſubject to intolerable Pains of the Head, becauſe the Perſpiration is thereby hindred. And this I obſerved in Monſieur *Rainſant* a Phyſician, and Keeper of the King's Medals; he had the Bones of his *Cranium* ſo ſtrongly united, that the Sutures were quite defaced, inſomuch that a ſerous acrimony, having no tranſpiration, had corroded the *Cranium* in ſeven or eight places of the *Os Coronale* and the Bones of the *Sinciput*, in order to eat a paſſage outwards; which thing did occaſion to him moſt dreadful Pains from time to time, and made him often take *Opium*, which he carried always about him; and this was the cauſe of his Death: for walking in the Garden of *Verſailles*, and going to take a little Water to dilute his *Opium*, he fell down into the Baſin, and was drowned.

Other Obſervations.

I have aſſiſted at the Opening three Bodies of the Blood-Royal of *France*, that is, of two Dukes of *Anjou*, and of *Madam* of *France*; the firſt dying at Three Years old, the ſecond at Seven Months, and *Madam* in the Fourth Year of her age. The Sutures of all their Skulls were ſo exceedingly cloſed, that there could be no Perſpiration. All the Phyſicians and Surgeons that were preſent at the Opening theſe Bodies, were convinced that this natural Diſpoſition of the Sutures was the chief cauſe of their Deaths.

Eight Bones of the *Cranium*.

The Bones of the *Cranium* are Proper or Common: The Proper are ſo called, becauſe they properly belong only to the Skull; they are Six, the *Os Coronale*, *Occipitis*, the two Bones of the *Sinciput*, and the two Temporal Bones. The Common are thoſe that are aſſiſtant both to the *Cranium* and the Face: They are Two, the *Os Sphœnoides* and *Ethmoides*. All theſe Bones will be the Subject of This Day's Demonſtration, after

I ſhall

I ſhall have obſerved to you, That all Skulls are not alike thick, in all Parts, and in all Bodies: And this the Surgeon ought to take great notice of, leſt he commit miſtakes in Trepanning, and in his other Operations that he makes on the Head; for there are Perſons whoſe *Cranium* is not ſo thick as a Crown, and others have it as thick as two or three Crowns; and likewiſe you will find the ſix Bones of the *Cranium* to be all of a different bigneſs.

1. *Os Frontis*, or *Os Coronale.*

The Firſt of theſe Bones is the *Os Coronale*, or *Os Frontis*; it is the hardeſt of all the Bones of the Head, next to that of the *Occiput*; its figure is ſemicircular, particularly in its ſuperior and lateral part; it is ſmooth outwardly, and rugged inwardly; it is ſituated in the uppermoſt part of the Face, and the foremoſt of the *Cranium*, whence it makes the Front or Forehead, and is therefore called the *Os Frontis.*

Circumſcription of the *Os Coronale.*

This Bone is bounded above by the Coronal Suture, and below by the Tranſverſal; the firſt of them joins it with the Bones of the *Sinciput* and the *Os Petroſum*, and the ſecond joins it to thoſe of the Noſe and the Cheek. There is alſo the Sphœnoidal Suture, that joins it with the *Os Sphœnoides.*

The Parts of the *Os Coronale.*

The Parts of this Bone are either Solid or Hollow; the Solid are the four Proceſſes, whereof there are two at the great angles of the Eye, and two at the ſmall angles, which do ſerve to form the Cavities of the Orbits. The Hollow part are of three ſorts, Holes, Pits, and *Sinus.* The Holes of the *Os Coronale* are in number three; two External, placed at the Eye-brows, a branch of the fifth pair of Nerves paſſes through them, and is diſtributed into the two Frontal Muſcles, and to the Proper *Elevator* of the upper Eye-lids. The third Hole is Internal, and ſituated above the *Criſta galli*; it is in this Hole that the root of the right *Sinus* of the *Dura mater* does adhere, which makes a ſmall fold, that ſinks into it in ſhutting it.

The Pits.

The Pits of the *Os Coronale* are four; two External, which make the Superior part of each Orbit; and two Internal, which do form the Anterior Cavities of the *Cranium*, and ſerve to lodge a great portion of the Brain, with the two Mamillary Proceſſes.

The *Sinus.*

The *Sinus* of the *Os Coronale* are two, called the *Sinus* of the Eye-brows, becauſe they are ſituated at the lower part of this Bone, near the Eye-brows. Many

Uſes

Uſes have been aſſigned to theſe *Sinus*; ſome ſay they are aſſiſtant to the Voice, others that they do contain Air, which ſerves for a Vehicle to Smells, and others that they ſerve for a Reſervatory both for the watry Humours which cauſe Tears, and for a medullary Humour that renders the Eye ſlippery; ſome ſay that they are Magazines of a mucilaginous Humour, that is properly the Snivel which drops through the Noſe; and laſtly others, that they are made only to render this Bone the lighter.

What forms the two *Sinus*.

But whatever Uſes have been given to theſe *Sinus*, I cannot think but that the mechanical Structure of the *Os Coronale* has the greateſt ſhare in their Formation rather than theſe Uſes: For if we obſerve well, we ſhall find that they are made by the Elongation of the two Tables of the *Os Coronale*, whereof the external Table does advance outwardly to form the ſuperior Eye-brow of the Orbit, and the internal Table does retire inwardly to make the roundneſs of the anterior Cavities of the *Cranium*, otherwiſe there would be an Angle that would incommode the Brain. And this perſuades me that theſe *Sinus* may have that Uſe which I do attribute to them. But yet it ought not to hinder you from looking upon them as two Sourſes that furniſh abundance of moiſt Humours to the Noſe; for it is experimentally true, that theſe ſinuous Cavities are every where clothed with a Membrane that inveſts the Noſe; and ſeeing it is a glandulous Membrane, we may conclude that theſe little glands may filtrate a *Lympha*, which quickly thickens by means of the Air which enters by reſpiration through the Apertures of the *Sinus*. As for the five or ſix other Uſes which the Ancients have given to them, they are meerly imaginary.

Os Occipitis.

The Second Bone of the *Cranium* is the *Os Occipitis*, which is oppoſite to the *Os Coronale*. It is the hardeſt of all the Bones in the Skull. The Reaſon that Authors give for it is, becauſe there being no Eyes behind the Head, Nature has made it ſo much the ſtronger, that it might the better reſiſt Blows when it receives them.

Its Figure.

This Bone is not ſo great as the former; it is of an oblong Figure, having five Sides or two circular lines, that terminate in a point; it is placed in the hinder-part of the Head, and make the whole hinder-part; it is bounded by the Lambdoide Suture, and the Sphœnoidal: the

the one joins it with the Bones of the *Sinciput*, and the other to the *Os Sphœnoides*.

Its Parts. The Parts of this Bone are either ſolid or hollow; the ſolid are two Proceſſes, which are received into the Glenoide Cavities of the firſt *Vertebra*; they do join the Head with the Spine by *Synarthroſis*. The hollow Parts are of two ſorts, either Holes or Pits.

Its Holes. The Holes are either common or proper; the common are two, one on each ſide of the *Os Petroſum*; they give paſſage to the *Nervi Vagi*, and to the internal jugular Veins. The proper are five; the firſt is ſingle and very great, this it is through which the *Medulla Spinalis* does paſs, and the vertebral Arteries which ſlip into a little notch that is behind the *Condyli* of the *Os Occipitis*, as they pierce the *Dura Mater*. Two others do give paſſage to the ninth pair of Nerves, which diſtribute themſelves wholly in the Tongue. The two laſt do let the vertebral Veins come forth, which are otherwiſe called the cervical Veins from the propinquity of the *Nucha*.

Its Pits. The *Os Occipitis* hath four Pits, two lower ones which are the greateſt, and do ſerve to lodge the *Cerebellum*; and two ſuperior that are ſmaller, and contain the poſterior Lobes of the Brain, which are ſeparated from the *Cerebellum*, by a tranſverſal incloſure that is formed by the *Dura Mater*, and that has a ſtrong Tenſion, in order to hinder the *Cerebellum* from ſuffering compreſſion; which might occaſion an interruption of the Courſe of the Animal Spirits.

M M

The Bones of the Sinciput. The Third and Fourth Bones of the *Cranium*, are thoſe of the *Sinciput*, and called *Oſſa Parietalia*, from their being a kind of Walls to the Head. They are of a more delicate, thinner, and ſofter Subſtance than thoſe I have already mentioned.

Their Figure. They are of a ſquare figure, their Magnitude ſurpaſſes that of all the other Bones of the Head; their Situation is on the two ſides which they poſſeſs intirely; the Sagittal Suture joins them together in their ſuperior part; the Coronal Suture unites them with the *Os Frontis* in their anteriour part; the Lambdoide joins them to the *Os Occipitis* in their poſteriour part; and laſtly the Squammous Suture unites them to the *Os Petroſum* in their inferiour part. Theſe Bones have their external ſurface very ſmooth, but the internal is unequal, by reaſon of the impreſſions that repreſent the upper

upper side of a Fig-leaf, and which have been made by a Branch of the external Carotide, which makes a kind of wrought-work on the *Dura Mater*, that covers all which lies under these Bones.

Each of these Bones have a little Hole pierced near the Sagittal Suture, through which the Branches of the External Jugular do pass, to receive the superfluous Bloud that could not be used in nourishing the Teguments, and to dispose it into the longitudinal *Sinus* of the *Dura Mater*. Upon which it may be observed, that all the Vessels which open into the great right *Sinus* of the *Dura Mater*, which is the superior, have a direction contrary to the course of the Liquor, for they do open from behind to before in Man; which is not so in other Animals. This Insertion is of great importance, because it serves to slacken the too rapid course of the Bloud, which is apt to run too quick in the *Sinus*, by reason of the fall from before backwards, men being in an erect Situation. Their Holes.

The Fifth and last of the Bones of the *Cranium*, are those of the Temples, so called *à temporibus*, because they use to shew Mens Ages, and because the Hairs which grow upon the Temples do grow white sooner than others; their superiour part is called laminous or scaly, being very thin; and their lower part is called petrous or stony, being very hard. NN The Temple-bones.

These are the least of all the proper Bones of the Skull, and in order to observe their figure the better, we must divide them into a superiour part, which is semicircular, and an inferior which resembles a Rock: they are placed on the sides and lower part of the Head, and are circumscribed upwards by a Suture that is called a false Suture although it be not so, and this unites them to the Bones of the Sinciput. Behind the Lambdoide Suture unites them to the *Os Occipitis*; and before or forwards, and below, the Sphœnoidal Suture joins them with the *Os Sphœnoides*. Artists among themselves do call such a Suture, a Suture with recovered jointings, by reason of a border it has that hides the Indentings or Toothings that are within. Sometimes also there are Skulls, in which all the circular brim of the scaly part of the Temples is indented outwardly; and the inferior brim of the Bone of the *Sinciput* that joins to it, is likewise indented after the same manner: the which does make an evident Suture outwardly, Their Bigness and Figure.

wardly, altogether like unto other Sutures that are called true ones, which join the principal Bones of the *Cranium* together. I have a *Cranium* that I keep by way of curiosity, wherein the Suture of the Bone of the Temples is after this fashion, so indented; which is a rarity, because among a great number of Skulls there is hardly one such to be found, in which the Suture of the Temples is so formed.

Their Prominences. There are divers parts that are to be shewn you in these Bones, and they are either prominent, or hollow. The protuberant parts of the *Os Petrosum* are their internal or external Processes; the internal are two, one on each side, like a great Rock, in which are the auditory Cavities, and the four little Bones that belong to it. The external Processes are three, the *Mastoides*, so called from resembling a Nipple; the *Apophysis Styloides*, like a Dagger; and Zigomatick Process, which by advancing outwardly, and by joining to an eminence that is in the *Os Malum*, does form the *Zigoma*.

The hollow parts of the *Os Petrosum* are of three kinds, Holes, Pits, and *Sinus*.

Their Holes. The Holes of the Bone of the Temples are five, four external and one internal: This last is within, and called the internal auditory Hole, for through this the auditory Nerve, which comes from the seventh Pair, has its passage; which Nerve is divided into two branches or parts, the one soft, and the other hard. The first branch is called soft, because it feels to the touch softer than the other, which to the touch seems more fibrous and more compact.

The First of the external Holes is the external Auditory, otherwise called the Conduit of Hearing, because it conveys the Air from without to the membrane of the *Tympanum*, which receives its impressions from it.

The Second is called the oblique Hole, it is large and of an oval figure, it opens obliquely into the Canal or bony Sinus. This gives an Entrance to the internal Carotide. The third is a little Hole that is found at the bottom of two Processes, between the *Apophysis Mastoides*, and the *Styloides*; through which comes forth the hard part of the Auditory Nerve. Lastly the fourth of the external Holes is the Canal of Communication, which opens to the Barrel of the *Tympanum*. Some part of the Air we do breath does enter

enter by this Canal into the Barrel without getting out again when once it is entred, by reaſon of the obliquity of the Conduit, which ſerves inſtead of a Valve.

The Pits are likewiſe Internal and External; the internal are two, and they do make the middle Cavities of the *Baſis* of the Brain; the external which are alſo two, do ſerve for the Articulation of the lower Mandible.

The *Sinus* are two; there is one in each of the *Apophyſis Maſtoides*. It is thought that theſe *Sinus* being divided into many little Cells, are appointed to receive the Air from the Barrel of the *Tympanum*, which Air does retire thither to give place unto other Air that comes from the Aqueduct

The little Bones of the Ear.

I have told you before that in this Rock which forms the *Os Petroſum*, there were four little Bones, to wit, the *Malleus*, *Incus*, *Stapes* and the *Os Orbiculare*. Theſe Names have been given them from their Reſemblance to thoſe Inſtruments. Theſe Bones are thought as big, and as hard, at their firſt formation, as ever they will be during the whole Life; nevertheleſs they do grow ſtronger more and more with Age, which makes them ſomewhat harder at the end, than they were at the beginning, being almoſt all of a cartilaginous Nature.

Three Cavities in theſe Bones.

In this Rock there are three Cavities, the Drum, the Labyrinth, and the Shell. And in the firſt of theſe Cavities are placed thoſe four little Bones, which are joined and articulated together, ſo that the Proceſs of the *Malleus* is tyed to the *Tympanum*, and articulated by its Head in the Cavity of the *Incus*. You will obſerve in the *Incus* or Anvil, two Legs, whereof the ſhorteſt is placed on the *Tympanum*, and the longeſt on the *Stapes* or Stirrop. Laſtly the *Stapes*, whoſe two Branches are placed on a large *Baſis*, does receive the little Tubercle of the *Incus* by its ſharp and ſuperior part.

O *Malleus.*

P *Incus.*

Q *Stapes.*

R

The circular Bone, or *Os Orbiculare.*

In Infants there is found a Bone called *Os Orbiculare*, it is made circular, like a Ring, on which the Membrane that we call the *Tympanum* or Drum, is ſtretched, as the Skin of a Drum is ſtretched on a Barrel, and this has given it its Name. The *Os Orbiculare*, which is the fourth of thoſe little Bones of the Ear, ſhut up in the Barrel, was firſt diſcovered by *Silvius De-le-Boe*. It is tied by a ſmall Ligament to the lateral and ſuperior part of the *Stapes*.

Articulations of the Bones that ſerve for Hearing.

Theſe little Bones being thus articulated, are tied to the *Tympanum* by a very thin Cord, which ſerves to faſten them, and afterwards to looſen them with the ſecond of the little Muſcles that are there ſituated. Theſe Parts being thus diſpoſed, and being ſtruck by the Impulſe of the Air that enters into them, do repreſent to the Brain by their little Motions the ſounds in ſuch manner as they are conveyed thither.

Os Sphœnoides.

The Firſt of the two Bones that are common to the Scalp and the Face, is the *Os Sphœnoides*. It has divers Names, both by reaſon of its different Figures, and its Situation. It is called by ſome *polyformous* and *multiformous*; others call it *Os Cuneiforme*, becauſe it ſinks into others like a Wedge into Wood; others call it the *Os Baſilare*, becauſe it is at the *Baſis* of the Brain; ſome do call it *Os Colatorium* or *Cribriforme*, becauſe the *Glandula Pituitaria* is placed upon it, and that it ſerves to derive or ſtrain the *Pituita* from the Brain: but this laſt Uſe is falſe, and does not agree with the new Experiments of Anatomy. The *Os Sphœnoides* is thick in its *Baſis*, and very thin in the Cavity of the Temples: it is ſufficiently large and hard; it is accounted but one Bone, although in Infants it may be divided into four. It is of ſuch an extent, that it touches all the Bones of the Head, and many of the upper Mandible, with which it is united by a Part of its Suture.

The Proceſſes of the *Os Sphœnoides.*

This Bone has both external and internal Proceſſes. The internal are three, called *Clinoides*, becauſe they reſemble a Saddle, or elſe are thought like to the Feet of a Bed. Two of them are anterior, and one poſterior, and together they do make a Cavity wherein the *Glandula Pituitaria* is ſeated. The external Proceſſes are two, called *Pterygoides*, becauſe they are like the Wings of a Batt.

Cavities.

The Cavities of the *Os Sphœnoides* are of three ſorts; for it has Holes, Pits, and *Sinus*.

Holes.

The *Foramina* or Holes are ſix on each ſide. The firſt is the Optick, through which the Optick Nerve paſſes. The ſecond is the great Cleft in the Orbit, through which the nervous Branches of the 3d, 4th, 5th, and 6th Pair do paſs, together with the bloud Branches of the Carotide and Jugular. The third is under the foreſaid Cleft; it is a round Hole that gives Paſſage to ſome of the Branches of the Fifth Pair of Nerves, but they

are

are its inferior Branches. The Fourth is a bony Channel, dug into the *Os Petrosum*, which goes obliquely to the Saddle of the *Os Sphœnoides*; it is in this Channel, or boney *Sinus* that the internal Carotide does lie, which rises thence towards the Saddle. The fifth Hole is the oval Cleft that lets the great Branch of the Fifth Pair of Nerves, which is the posteriour Branch, come forth. Lastly the sixth Hole of the *Os Sphœnoides* is a little round hole, through which there passes a Branch of the external Carotide, that makes the Resemblance of a Fig-leaf on the *Dura Mater*, under the Bone of the *Sinciput*. It is likewise this Branch that forms the Shape of a Leaf so well on the internal Table of the said Bone.

Pits. The Pits are three; one internal on the Saddle of the *Os Sphœnoides*, and which serves for a *Basis* to the *Glandula Pituitaria*, and two external, which are in the *Apophyses Pterygoides*.

In the middle of the *Os Sphœnoides*, under the Saddle, are found two *Sinus* that are separated by a boney *Lamina*, which open in the Nose. These two *Sinus* are invested with a Membrane that is altogether glandulous, and is always covered with a *Mucus*, because the little glands of this Membrane do separate from the Bloud a *Serum* which acquires consistence by its continuance in the *Sinus*, and when they are full of it, this *Mucus* is thrown out at the Apertures into the Nose, by mixing with the Snivel it there meets.

T *Os Ethmoides.* The Second and Last of the Bones that are common to the Scalp and Face, is the *Os Ethmoides*, called by some *Os Cribriforme*, because in its upper part it is full of little Holes, like a Sieve; and by others 'tis called *Os Spongiosum*, because all its lower part is spungy; it is situated in the middle of the *Basis* of the Forehead, and fills the Cavities of the Nostrils.

Its Bigness. This Bone is the smallest of all the Bones that compose the *Cranium*; it is joined to the *Os Coronale*, in its upper part by a common Suture that is called the Ethmoidal Suture; and to the *Os Sphœnoides* by the Sphœnoidal Suture.

Its Division. The *Os Ethmoides* is divided into three parts, the upper, or Sieve-like part, which has abundance of little holes; the lower, which is spungy and does separate the Cavity of the Nostrils in twain; and into lateral parts, which are full and flat, and do make part of the Orbit.

Crista Galli. You may see a Prominence in this Bone, that advances into the Cavity of the Cranium, and by reason that it resembles the Comb of a Cock, is called *Crista Galli*; it is very hard, and part of the *Dura Mater* is tied to this place, and called *Falx*, because it is like a Scythe, which *Falx* divides the Brain into two parts.

The Uses of the Holes of the *Os Ethmoides.* There are two Uses assigned to the Sieve-like holes; one is to give passage unto many small Fibres, which coming from the *Processus Mamillares*, disperse themselves in the Coats that invest the Cavities of the Nostrils; and the other is to filtrate the many serous Humours of the Brain, which gliding along these Fibres, do fall into the Nostrils.

Observation. But upon this Occasion I cannot but observe it to be a false Opinion, that the Serosities do run, or trickle through those Holes into the Nose; it is an Error of *Willis*. For these little Holes of the Sieve-bone are too closely stopt by the Nerves, and by the *Dura Mater*, to let the least Drop of *Lympha* pass through them.

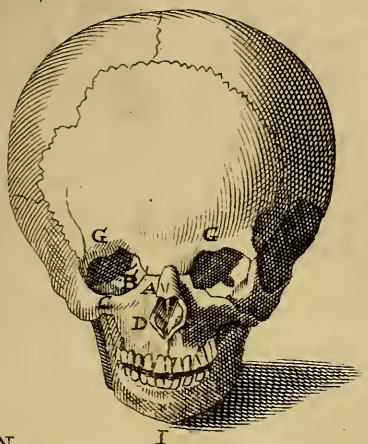
Thus, GENTLEMEN, I have shewn you all the Bones, that I was to demonstrate this Day, to morrow we will examine those of the Face.

Of the BONES *of the* FACE.

The FOURTH DEMONSTRATION.

An *Elogium* on the Face. IF you have found, GENTLEMEN, in the Composition of the *Cranium*, a Structure worthy your Admiration, you will not be less surprized with that of the Bones of the Face; and if the *Cranium* deserves its Commendations, because it contains the Brain, which is the noblest Part of all the Body, I am persuaded that the Face will not deserve much less Consideration, since it contains all the Senses, which makes it justly to be called the very Image or Representation of the Soul.

It is this Part likewise that represents before us all the Passions of the Mind so to the Life by such undeniable Characters, that it causes us to appear either courageous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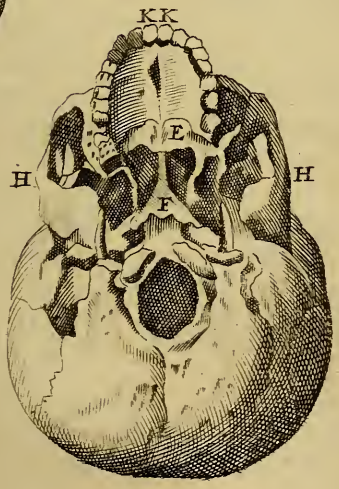
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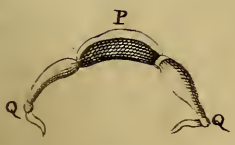
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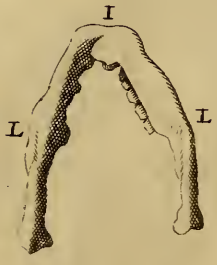
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ragious or fearful, joyful or sad, and generally such outwardly as we are really within. And since the Face is the Seat of Beauty, and does attract by its Charms the Eyes of all Men, as well as captivates the Hearts, we ought to know that nothing does contribute more to its Beauty than the Bones of which it consists, seeing it is from their just proportion that the Excellence of all the Parts of the Face does depend; for if, for Example, the ill Shape of the *Os Frontis* spoils the Forehead, if the Bones of the Nose make that Part deformed, and if the Bones of the Lower Jaw do make the Chin too sharp, it is certain the Face can never be Beautiful, although the Lips should be never so ruddy, the Mouth never so little, although the Complexion be all Lilies and Roses, and the Skin white and fine.

The Face is the Seat of Beauty.

What I have said in respect of the Bones of the Face, may be also understood of those of the rest of the Body; for if one of the Clavicles jets too much outwardly, it spoils the Shape of the Neck, and if one of the Bones of the Leg be too big, or should be crook'd, it is a disfigurement to the whole; insomuch that the Bones do not only recommend the Stature to be suitable or disagreeable, but they contribute to the Beauty of the Body.

The Bones give the Stature.

The Face consists of two Mandibles or Jaws, to wit, the Upper Jaw which comprehends all from the Eye to the bottom of the Upper Lip; and the Lower Jaw which extends from the top of the Under Lip to the end of the Chin.

Division of the Face.

The Upper Jaw is immoveable, the Lower on the contrary is altogether moveable, seeing Mastication, which is an Action so necessary sustaining for Life, depends wholly upon it, and it serves for Comminution of the Nourishment; In like manner as in a Mill it is sufficient for the well grinding the Corn that one of the two Mill-stones only should move; with this Difference nevertheless, that it is the Upper Mill-stone which being plac'd over the other, does easily grind the Grain, and turn it into Meal; and on the contrary it is the Lower Jaw that by means of divers Muscles and by its Pressure against the Upper Jaw does chew and grind the Aliments. And in this we ought to admire the great Wisdom of the Almighty, who has not thought it proper to let the Upper Jaw move, because being knit so fast to the *Cranium*, it would with its

The Lower Jaw does only move.

own Motion have forced the whole Skull to move at the ſame time; which would have been the more incommodious to the Brain becauſe it requires Eaſe and Quietneſs for performance of its Functions. Moreover, if God had appointed Mens Upper Jaw to move, as it does in Parrots, He muſt then have taken away its faſtening to the Bones of the *Cranium*, and muſt have made it prominent forwards, as it is in Parrots. But ſince this would have been a great Deformity to the Face, the Author of Nature has avoided thoſe Inconveniences, by ordering only the Lower Jaw to have any Motion.

Eleven Bones in the Upper Jaw.

There are eleven Bones in the Upper Jaw, five on each ſide, and one in the middle; the firſt is that of the Noſe, the ſecond the *Os Unguis*, the third is called by the French *de la Pommette*, the fourth the Jaw-bone, the fifth the Bone of the Palate or Roof of the Mouth; the ſixth, which is ſingle, is the Share bone. Theſe Bones are ſeparated from the *Cranium* by common Sutures, and joined together by *Harmonia*, one of the kinds of *Synarthroſis*; which cauſes them to have no Motion. Let us examine them one after another.

A The Bones of the Noſe.

The Bones of the Noſe, which offer themſelves firſt to our View, are of a ſolid Subſtance, though they be very thin; they are very ſmall, and of a Pyramidal Figure; they are placed as you ſee, on the upper part of the Noſe, and compoſe what is called the Bridge of the Noſe, for the wings which make the lower part of it, being Cartilaginous, are ſeparated in the boiling.

How bounded.

Theſe Bones are terminated above by the tranſverſal Suture, which joins them in their upper part with the *Os Frontis*, and on the ſides by two *Harmonia* Sutures, that is, one of the Sutures joins them together, and is in the middle of the Noſe, and the other unites them with the two Jaw-bones. We muſt obſerve that theſe Bones are more ſmooth in their outward Surface, than they are in the inward, and that their lower part is unequal, and in Slits, to the end the Cartilages may the better ſtick to them.

B *Os Unguis.*

The two Bones which follow are called by the French *Os Unguis*, becauſe they have the Bigneſs and Figure of a Nail; they are of a thin Subſtance like a Scale. Theſe are the ſmalleſt Bones of the Upper Jaw; their Situation is at the great corner of the Eye; they have been called by ſome the Lachrymal Bones, but impro-

improperly, becauſe in Man there is no *Glandula Lachrymalis* in the great corner of the Eye. Some have alſo called them the Orbit-bones.

Theſe Bones do not hold very faſt to the others, for which reaſon they are eaſily loſt, and they are not to be found in a great many Skeletons: They touch four Bones, the *Os Frontis*, the Bone of the Noſe, the Jaw-bone, and to that part of the *Os Ethmoides* which forms the Orbit of the Eye. Bones that are eaſily loſt.

C

The Fifth and Sixth Bones are the Bones of the Cheek; they are very large, and of a hard and ſolid ſubſtance; they are of a triangular figure, their middle part is a little prominent outwards, and round like an Apple. I do believe that this Figure of theirs, and the Ruddineſs which comely Perſons do uſe to have in thoſe places, have cauſed them to be call'd by the name *de la Pommette*, in French. The Cheek-bones.

Theſe Bones do make the Cheek, and the lower-part of the Orbit; they are alſo faſtned to four other Bones, the *Os Frontis*, the *Sphœnoides*, the Jaw-bone, and the *Os Petroſum*: There are obſerved in each of them three Proceſſes; one forms an Eminence, which riſing upwards, does make the little corner of the Eye; another advancing towards the Noſe, does make the greateſt part of the lower Eye-brow of the Orbit; and the third joining with a Prominence of the *Os Petroſum*, makes a great part of the *Zygoma*. Three Proceſſes in the *Os Malæ*.

D

The Seventh and Eighth are the proper Bones of the Jaw, and call'd the Jaw-bones; theſe Bones are the moſt ſpungy, and the greateſt of all the Face; theſe do make ſome part of the Cheek, and do contribute to the formation of the *Orbita* in its inferior part; they compoſe the greateſt part of the Palate, and articulate all the Upper Teeth. The Jaw-bones.

It is hard to deſcribe their Figure, becauſe they have a very extraordinary one; they are placed on the ſide, and under the Bones of the *Os Malæ*, poſſeſſing the inferior part of the Upper Jaw. They are obſerved to touch four different Bones, thoſe of the Noſe, the Palate, the *Os Malæ*, and the Bones of the *Orbita*. Their Figure.

There are found in theſe Bones three ſorts of Cavities, Holes, Pits, and *Sinus*. Cavities.

The *Foramina*, or Holes, are Internal and External: The Internal are four; two are called Inciſives, becauſe they are directly under the Teeth called *Inciſores*; and *Foramina*.

two others on the lateral and posterior parts; these last are common to the Bones of the Palate. The External are two, and called Holes of the Orbit, because they are placed on the superior and middle part of these Bones, near to the Orbit. The Nerves of the Fifth Pair do pass through them, and are distributed into the parts of the Face.

The Pits are sixteen in each Jaw, and they are the *Alveoli* in which sixteen Teeth are fastned.

The *Sinus* are two, one in each Bone that lies along the extremities of the Roots of the Teeth. Their Use is to furnish a *Mucus*, by reason of the Membrane that covers them within.

E The Bones of the Palate of the Mouth.

The Ninth and Tenth Bones of the Upper Jaw, are those of the Palate, which are very hard, but so small, that they do make but the least part of the Palate; the greatest part of the Roof of the Mouth being formed by the Jaw-bones, which reach unto the Line that separates the one from the other.

Their Figure.

These Bones being a little bigger than they are long, are of a Figure almost square; their situation is at the bottom of the Palate, and they do make the deepest part of the Roof of the Mouth; they are joined together by the Suture of the Palate, which advancing forwards near to the *Dentes Incisores*, do also unite the two Jaw-bones. They are likewise fastned to the *Apophyses Pterygoides*, by the Sphœnoidal Suture. They are supported on the following Bone, and have each a *Foramen*, called *Foramen Gustativum*, through which there passes a branch of the Fifth Pair of Nerves.

F The Eleventh Bone.

The Eleventh Bone of the Superior Jaw is called the Plough-Bone, and so called because it resembles the Coulter or Share of the Plough: This Bone is a single one, having no fellow to it; it is placed in the middle, above the Palate; it is hard and small, joined with the *Os Ethmoides* and *Sphœnoides*, which have both some small eminences that are received into the cavities of this Bone; and which by this means do strengthen it in its position: It is this Bone that divides the interior part of the Nostrils into two.

G G The Orbits of the Eyes.

The Orbits of the Eyes are two great Cavities, situated at the lower part of the Forehead, and serve for a Mansion or habitation to the Eyes, and they defend them against all that may offer to hurt them; their Figure is Pyramidal, having outwardly a great Aperture,

ture, which by leſſening according as the Orbit ſinks inwardly, does form a kind of Perſpective; their bottom is pierced through, for a paſſage to the Optick Nerves.

Theſe Cavities are compos'd of Six different Bones, which do all together form the extent and depth of the Orbit. Of theſe ſix Bones, there is one proper to it, and five common to it and others: The proper one is the Bone of the Orbit, or the Orbitary-Bone, which ſerves only for the uſe of the Orbit; it is ſituated in the great corner of the Eye. Of the common Bones, there are three that belong to the *Cranium*, and two to the Face. The firſt of thoſe of the *Cranium*, is the *Os Frontis*, which forms the ſuperior part of it, and ſerves for an Arch to the Orbit; the ſecond is the *Os Ethmoides*, which makes the lateral part of it, towards the Noſe; and the third is the *Os Sphœnoides*, which forms the deepeſt or moſt inward part of it: The two Bones of the Face do form its inferior part, of which the Bone *de la Pommette* makes that part which is near the little corner of the Eye, and the Jaw-bone that which is next to the great corner.

They conſiſt of Six Bones.

Before I ſhall proceed unto the Bones of the Lower-Jaw, I will let you ſee the *Zygoma*, called by ſome *Os Jugale*; it is not one ſingle Bone, but an union or coalition of two prominences of Bones, whereof the one comes from the Temporal-bone, and the other from the Cheek-bone. Theſe Prominences, or Proceſſes, are joined by a ſmall oblique Suture, which I called the Zygomatick Suture, when I ſhew'd it.

H H

The *Zygoma*.

It is remarkable, That theſe two Bones do together make an Arcade, that has two conſiderable Uſes; one is to give paſſage to the Muſcle *Crotaphytes*, and to ſerve for a defence to it; and the other is to give riſe to the Muſcle *Maſſeter*, whoſe buſineſs is with the *Crotaphytes*, to help the chewing of the Meat.

Uſes of the *Zygoma*.

The Lower Jaw conſiſts of two Bones until the ſeventh year of age, and then they turn into one, joining together in their anterior and middle part by *Symphyſis* without a *medium*, as the *Epiphyſes* do, which from Cartilages do become Bones by length of time.

I I

The Lower Jaw.

Theſe two Bones are large enough, or as large as was requiſite, to ſerve for a *baſis* to ſixteen Teeth that are articulated into them; their Subſtance is ſolid and very hard, to the end they may be ſtrong enough to bite,

K K

The two Bones of the Lower Jaw.

bite, and to chew. They together make a better figure in Man, than in any other Animal; for it is ſemicircular, and reſembles an Arch; they are ſmooth and even outwardly, and a little rough and uneven inwardly, and in their inferior part, in order to facilitate the riſe and the inſertion of the Muſcles. That which is rounded before is named the *Baſis*, and their brims are called Lips, of which they have one internal, and another external; in their upper part they are faſtened to the *Os Petroſum*, with which they are articulated by *Arthrodia*, and bounded below by the Chin, which makes their inferior and interior part.

To examine theſe Bones the better, we muſt conſider the Parts, which are Solid, or Hollow.

The Proceſſes. The Solid Parts are Superior and Inferior; the Superior are four, that is, two Proceſſes, or Heads, placed on a little Neck, called *Condiloides*, which do make them to articulate with the *Os Petroſum*, and two other Proceſſes or Points, call'd *Coronoides*, which ſerve for the inſertion of the Muſcles *Crotaphytes*. The Inferior Parts are three; one anterior, call'd the Chin; and two poſterior, call'd Cones, of which one is on the right, and the other on the left, where the Muſcle *Maſſeter* is outwardly inſerted, and inwardly the *Pterygoides*, which do ſerve for maſtication.

The Cavities. The Hollow Parts are Holes, Pits, and *Sinus*: The Holes are Internal or External; the Internal are two, placed at the Angles which do receive a Nerve of the Fifth Pair, and alſo an Artery which goes to all the roots of the Lower Teeth. They do likewiſe give paſſage to a Vein for carrying away the Blood. The External, which are alſo two, are placed towards the anterior and middle part of the Lower Jaw; it is through theſe Holes that a part of the Nerve goes out which came in by the Internal, the branches of which Nerve proceed to be diſtributed into the External parts of the Chin.

The Pits are ſixteen, as they were in the Upper Mandible; and they are Cavities, or *Alveoli*, in which the ſixteen Teeth are ſet and faſtened. Some of the *Alveoli* have but one Pit, others two, ſome three, and others four, according as the Teeth have more or fewer Roots.

The *Sinus* are two, one on each ſide; theſe are Internal Cavities that lie along the Jaw, and they do contain

contain the Matter of which the Teeth are to be formed.

The Lower Jaw has divers Uſes; the firſt, which is for Ornament and Beauty, is common to it, and to other parts of the Face; the ſecond is for Maſtication; and the third for forming the Voice. Uſes of the Lower Jaw.

We do not commonly Demonſtrate in a Skeleton all the Teeth both of the Upper and Lower Jaw, becauſe there are very few of them wherein ſome of the Teeth are not wanting. Moreover, we ought to obſerve, That they do not fall out of the Jaws in a living Body, as they do out of a Skeleton; becauſe in the one there are Gums that keep them faſt in their *Alveoli*, whereas in all Skeletons they are loſt, or fall out in the boiling. L. The Teeth.

The Teeth are ſmall hard Bones, white and ſmooth, articulated in the Jaws by *Gomphoſis*, which ſerve to chew and grind the Meat. Definition of the Teeth.

They differ from other Bones, in that they have no *Perioſteum*, which is the cauſe they have no ſenſe of Pain, but only at their Root, where the Nerve enters; for we muſt agree, that the part of the Teeth which appears outwardly, is depriv'd of all Senſation.

Although the Teeth are very hard Bones, and do exceed all the Bones of the Body in point of hardneſs; nevertheleſs they do wear and conſume by their continual action, and by their friction one againſt another. The proof of which is ſo evident, that when one Tooth fails, that which is oppoſite to its place not meeting it in the chewing, does grow; and exceeding the length of thoſe which are on each ſide of it, does riſe into the cavity of that which is loſt: And this is the reaſon why Nature not being able to hinder their wearing away, as cautious as it is, has given them Veſſels which convey to them a Matter that nouriſhes and repairs them. That the Teeth wear away, and grow.

The Teeth are made of the Seminal Liquor of the Egg, as all other Parts are, from their firſt conformation; they are found in the cavities of the *Alveoli*, even in ſome *Fœtus* that have not yet accompliſhed their Nine Months. It is true, they have not then attained their Perfection, ſince only a great part of their Table is but then formed: But there is obſerved in thoſe ſame *Alveoli* a *Mucus*, which growing dry with time, does puſh out the remainder of the Tooth, in proportion The firſt Principle of the Teeth.

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tion to its formation. The Time is not certainly fix'd by Nature for the expulsion of the Teeth; there are some Infants who have had some Teeth even from the birth, others in the first month, and others in seven or eight months, which is the usual time; and there are some of them who do not begin their Toothing till they are a year or two old.

Why the Teeth do come one after another.

The Teeth do not come forth all at a time, the *Incisores* or Cutters of the Upper Jaw do first break forth; because being the smallest of all, they the sooner acquire perfection; and being sharp, they do the sooner cut the Gums. Next appear the *Incisores* of the Lower Jaw, then the Dog-teeth, and lastly the Grinders.

Breeding of Teeth causes Pain.

Seeing the Extrusion of the Teeth does use to be very painful to Infants, and to cause dreadful Accidents, Nature does therefore wisely expel them one after another, or at most but two at a time; because if they were to come all at a time, the Infants would not be able to overcome the Convulsions which would happen, without the greatest danger, and perhaps loss of their Lives; as it has been often experienc'd in those that have had three or four coming together.

When Twenty of the Teeth have appeared, the rest do not come forth for some years: Nevertheless, we use to say, the Infant has all his Teeth; which is to be understood of all that he ought to have at that age, the number being commonly twenty in twenty months.

The Infant to be Wean'd after he has Twenty Teeth.

It is thought the most proper time then to Wean an Infant, and not before; because the Nourishment of Milk is not only proper for the better breeding the Teeth, but also for the keeping the Gums moist, and especially when the latter Teeth are bred; I say, the latter, because that having their ends thicker, they break forth of the Gums harder than the first.

The Use of their Coral.

When the Toothing comes on, they do hang a Rattle or Coral about the Infant's Neck, both for their diversion by the noise of the Bells that rattle, and for the frequent putting it into their Mouths, which has two advantages, whereof one is to cool their Gums that are inflamed by the pains which are caused by the extrusion of Teeth, and this happens from the coldness of the Crystal or Coral that is at the end of the Rattle; the other is to facilitate the extrusion of the Tooth that is ready to Cut, the which the Infant readily does, who feeling pain, and squeezing the Coral between

tween his Gums, does by this means help the Tooth to Cut the more eaſily.

The Twenty firſt Teeth being ſhot out, or all cut, the Child remains in this condition unto the Seventh year of his age, and then four more of them do appear behind the former. At Fourteen years old there come four more; and laſtly, about Twenty there do riſe four more, which are call'd the Wiſe Teeth, becauſe they come at an age when People ſhould begin to be Wiſe. All theſe Teeth together do make the number of them Thirty-two. The Wiſe Teeth.

Thoſe Twenty firſt Teeth are called the Milk-Teeth; they fall out commonly towards the Sixth or Seventh Year, becauſe they are Double from their firſt conformation, and becauſe thoſe which are under the *Alveoli* do puſh forwards the former towards that time. And this is eaſie to obſerve, ſince it is certain, that when one Tooth falls out, another is found to lie underneath, that puſh'd it, and cauſed it to fall out. It is good to help out thoſe Milk-Teeth, ſo ſoon as they begin to looſen, that thoſe which come underneath, and that are to continue for life, may riſe ſtraſt, and in a good poſition. It is further obſerved, That thoſe firſt Teeth, when they fall, do not prove to be perfect Teeth, having loſt a part of their Root; becauſe thoſe that ſucceed underneath do poſſeſs their place, and as they grow up, do force the former to fall out; and if it chance to happen that ſome new Tooth ſhall come in elderly Perſons, ſuch as are Fifty or Sixty years old, or if one ſhould chance to ſhoot out in the place of another that has been drawn at ſuch times of life, I aſſert, that theſe new Teeth had their principle from the firſt conformation of Parts; for ſince we cannot Draw a ſound and perfect Tooth, without breaking the Veſſels at the Root, I am perſuaded, that there can be no return of new ones, unleſs there be ſome *Semen* of them underneath; ſome firſt principle being neceſſary for the production of Teeth, as it is to all other things; and this Principle depends on the diſpoſition of Matter, which once failing, can never regenerate. New Teeth have their Principle in the *Alveoli*.

All the Teeth are ranged in the two Jaws, one by another, in a certain order, although ſometimes there will happen a Double Row of them; but that is to be regarded as a vicious conformation, becauſe it is both A Double Row of Teeth inconvenient.

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a deformity, and inconvenient, especally when the second Row happens outwardly; for when it comes within the first, it is the less inconvenient.

Some Infants born with Teeth.

Some do imagine that a greater number of Teeth than ordinary, and their coming over-early, as when Children are born with them, are Signs of Good-Fortune, and of their being Predestinated: But it is an Errour; since the having more or fewer Teeth, depends upon the abundance or want of Matter in the *Alveoli* at their first conformation. I believe only, those are happy that have Two and thirty Teeth, and have them good in their kind, because it is a means of Health; Mastication being better perform'd by those who have them all, rather than those who want some: For if the Meat can't be sufficiently chew'd, but is fain to be swallow'd in bits or morsels, for want of Teeth, the Stomach not being able to make a good Digestion, the distribution of the Nourishment can't be so well perform'd, as when it has been well prepar'd in the Mouth by Mastication, through the means of the Teeth.

When I said, all the Bones have their Cavities, I did not think that I ought to except the Teeth, since they have one in their middle, where the Nerve is inserted. It is in this place that a serous Acrimony is sometimes found, which corrodes and spoils the Tooth so sensibly, that we are oblig'd to Draw it out; because this sharp *Serum* having begun to eat into the Tooth, it continues to do so, until it has destroyed it by piece-meal.

No Worms in the Teeth.

Some have thought that little Worms will grow in the Teeth, but they are mistaken; it being only a way of expressing our selves, founded upon the resemblance which the Holes of these Teeth have, like unto those which little Worms do use to make when they corrode a-part.

The Teeth fall out with Old Age.

It is a rarity for a Man to preserve his Teeth sound during his whole Life; for besides that they often grow rotten, which forces us to Draw them, they also fall out of themselves, as we grow old; because they become very dry, and the Gums loosen from their Roots. There are some Old People whose Gums do harden to such a degree, that it supplies their want of Teeth, and they can chew their Meat upon them, but never so well as they did with the Teeth themselves.

The Uses of the Teeth.

The Teeth have three Uses; the first and chiefest is for Mastication: The second is to distinguish the Voice;

Voice; I do not pretend that they are absolutely necessary for Speech, but only for the speaking well, whence it comes that toothless Persons find a difficulty to pronounce distinctly certain letters, and certain words. Lastly, The third Use is for Ornament; for it is a great Deformity when they grow black and rotten, or when some of them are gone, especially those before. On the contrary, it is a grace to a comely Person to have them well shap'd, in good order, and very white.

Their Number.

Although I have before observed to you, that the Number of the Teeth is commonly Thirty two, to wit, Sixteen in each Jaw; nevertheless, some Persons have happened to have more, and sometimes fewer. There have been seen some Persons who have had but two in all, that is, one continued Bone in each Jaw, which served instead of Teeth. These Two and thirty Teeth are divided into *Incisores* or Cutters, and into Dog-teeth, and Grinders.

M M
Two of the *Incisores*.

The *Incisores*, or Cutters, are so call'd, because they do cut and divide Meat like a Knife. Others will call them the Laughing-teeth, because they appear so plain when a Man laughs. They are eight, four in each Jaw, placed before the rest outwardly, and in the middle of the others; their outward surface is like an Arch, and the interior is hollow; they are sharper, more cutting, and shorter than the rest; they are planted in their *Alveoli* by single Roots, which terminate in a point; wherefore they fall out easily, especially the upper rank of them.

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One Dog-tooth.

The Dog-Teeth are so called, because they serve to break and crack hard bodies; which makes us commonly to put the Bones we would gnaw under these Teeth. They are four, two in each Jaw; they are placed next to the Cutters, one on each side; they are thick, strong, and solid; and are fastened in their *Alveoli*, or Sockets, by single Roots, like the Cutters, but more deeply and strongly, for they exceed all the rest in length. The Upper Dog-Teeth are called Eye-Teeth, by reason that a part of the Nerve which moves the Eyes is branched towards these Teeth; wherefore many do think it is dangerous to Draw them.

O O
Two of the Grinders.

The Grinders are so called, because they do serve, like Mill-stones in a Mill, to break and grind all sorts of

of Meat. There are twenty of them, ten in each Jaw, and five on each side; they are hard, great and large; that of them which is next to the Dog-tooth, is lesser than the others, and all of them encrease in bulk, according to their deeper situation in the Mouth. These Teeth have divers Roots, which serve the better to fasten them in their Sockets. It is observed, that the Lower Grinders have but two or three Roots, whereas the Upper have three or four; which is not without good reason in Nature; for the Upper being in a hanging position above, have occasion for a greater quantity to keep them fix'd and firm.

P *Os Hyoides.* And now I shall Demonstrate the *Os Hyoides*, to finish the Number of Threescore Bones of the Head, among which it is comprehended. It is so called, from being like the Greek letter Υ, which has also given it the name of *Os Ypsiloides:* This is the Bone that is seen at the end of a Neat's-Tongue. It is situated at the *basis* of the Tongue, upon the *Larynx*. It has ten Muscles which keep it in its proper place, as ten Cords do keep up a Mast of a Ship; it touches no other Bone, but is tied above by Bones that are called its superior *Cornua*, to the two *Apophyses Styloides* of the Bone of the Temples by small Ligaments, and below at its inferior *Cornua* it is joined unto the two wings of the *Cartilago Theroides* of the *Larynx*, by Ligaments of the same nature with those that tied its upper part: insomuch that its true Articulation is not *Syssarcosis*, as the Ancients pretended, but a true *Syneurosis*, seeing it is fastened by Ligaments, and the ten Muscles which beset it, do only serve to move it with the Tongue, by drawing it up and down, and sideways. It is composed of five Bones, of which the greatest makes the *Basis*, which is the anterior and middle part of this Bone. This *Basis* is arched outwardly, and hollow within; two other lesser Bones are united to this, one on each side, and two very small ones are joined to the ends of these last: These four small Bones do all together make the sides of the *Os Hyoides*, and they are call'd the *Cornua*.

Q Q The *Cornua Ossis Hyoidis.*

The Uses of the *Os Hyoides.* The principal Use of this Bone is not to serve for a Prop and Support to the Tongue, (as many have written,) for it would be too weakly supported thereby; but it is for to facilitate the admittance of Air into the *Aspera Arteria*, and the passage of Meat and Drink into

into the *Oesophagus*, by keeping the *Pharynx* in that just Bigness it ought to have, for the free Passage of the Nourishment.

Seeing the Cavities of the Head are very numerous; I believe it will not be useless here to make a repetition of them before I make an end of this Subject, and shall say once more, that they are of three sorts, *Foramina*, Pits, and *Sinus*.

A Recapitulation of all the Cavities of the Head.

In Order to examine well the *Foramina*, or Holes of the Head, we must divide them into Internal, which are ten in Number on each side without reckoning the little Holes of the *Os Cribriforme*, and the great Hole of the *Os Occipitis*. The first is the Optick; the second is the great Cleft of the Orbit; the third is the great round Hole; the fourth is the great Canal or bony *Sinus*: the fifth is the Oval Cleft; the sixth is the little round Hole; the seventh is the Internal Auditory; the eighth is the Hole called the great Jugular; the ninth is the Hole of the ninth pair of Nerves, called the lateral Hole; Lastly the tenth is the Cervical.

Ten Internal *Foramina* on each side of the Head.

There are also eleven External *Foramina* on each side; the first is that of the Eye-brows; the second is the Nasal Canal, otherwise called the Lachrymal Canal, which is almost all of it cavernous in the Superior Part of the Jaw-bone, in the Place where it is joined with the *Os Unguis*; the third is the Internal Orbitary, or a Hole in the Orbit that is found placed against the *Os Planum*; the fourth is the External Orbitary, it is the Egress of a Canal that is made in that part of the Jaw, which forms the lower part of the *Orbita*, this Hole is placed outwardly at the Edge of the Orbit in the Jaw-bone; the fifth is the Incisive, which opens by two different Apertures into the Nose, it is common to both the Jaw-bones, and is situated under the two first Teeth called *Incisores*. It is through this Hole that the Tears which fall into the Nose do afterwards come into the Mouth, and hence it is that in crying a Man spits much, by reason of the abundance of Tears that run into the Mouth, and by their Acrimony do irritate the Salivating Vessels; The sixth is the Hole of the Roof of the Mouth, that is called *Foramen Gustativum*, through which there passes a Branch of the Fifth Pair of Nerves; the seventh is the External Auditive, or the Conduit of Hearing; the eighth is the Oblique, which opens into the bony Canal; the ninth is a little

Eleven External *Foramina*.

Hole between the *Apophyſis Maſtoides* and the *Styloides*; the tenth is the Canal of Communication, or the Aqueduct ſo called, becauſe it has ſometimes ſerved for a Sink to the purulent Seroſities that come from Abſceſſes in the deepeſt parts of the Throat, and which are diſcharged at the Ear. Laſtly the eleventh is a ſmall Hole in the Bone of the *Sinciput* near the Sagittal Suture.

Six Internal Pits. The Pits are more eaſy to ſee than the Holes; they are Internal and External. The Internal are ſix, and are all perceived ſo ſoon as the *Cranium* is opened; they are ſituated at its *Baſis*; two of them are leſs than the reſt, and are in the anteriour part of the *Cranium*, that is in the *Os Frontis*; two a little bigger than thoſe are in the *Os Petroſum*, and the two largeſt are placed in the *Os Occipitis*, unto which I ſhall add the two Superior.

Fourteen External Pits. The External Pits are fourteen, ſeven on each ſide, of which the firſt does receive the *Condylus* of the Lower Jaw, for its Articulation with the *Os Petroſum*; the ſecond is in the *Apophyſes Pterygoides*; the third is toward the Hole that is rent in two, through which the *Par Vagum* does paſs; the fourth is on the Palate; the fifth makes the Arch of the Palate; the ſixth is under the *Zygoma*; and the ſeventh is the Cavity that forms the Orbit.

Eight *Sinus*. The *Sinus* are Eight; two in the Upper Jaw; two in the inferior part of the *Os Frontis*. two in the *Os Petroſum*, in the *Apophyſes Maſtoides*, and one in the Saddle of the *Os Sphœnoides*.

Thus, GENTLEMEN, You have had all the Cavities of the *Cranium* and the Face ſhewn you, in the Number of which I have not comprehended thoſe of the Lower Jaw, becauſe they are ſeparated from the reſt of the Head. In the two following Demonſtrations I ſhall ſpeak of the Bones of the Trunk of the Body, which will make the ſecond part of the Skeleton.

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Of the BONES *of the* SPINE.

The FIFTH DEMONSTRATION.

YOU have seen, GENTLEMEN, all the Bones of the *Cranium*; and now Order requires that I should shew you those which do form the Trunk of the Body. These are divided into three sorts, the Bones of the Spine, the Bones of the *Thorax*, and the *Ossa Innominata*. I shall begin this Day with those of the Spine, reserving those of the *Thorax*, and the *Ossa Innominata*, for your future View in the next Demonstration. The Bones of the Trunk divided into three sorts.

The admirable Structure of the Spine does no less display the Wisdom of God, than did the Composition of the *Cranium*; for as He made this Part altogether bony for the containing and defending the Brain, so it was necessary in like manner that the Spine should be bony, to the end that the Marrow, which is a continuity with the Brain, should thereby be preserved and defended in the long Passage it has to take. It is perforated on the right and left, as the *Cranium*, with many *Foramina* for Transmission of the Nerves which are appointed to convey the Animal Juice into all the Parts; in effect, it would be in vain for the Brain to separate this Juice, and to be, as I may say, the Fountain of it, if there were not an Aqueduct, such as the Spine to convey it to all the Parts by means of the Nerves.

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In order to understand exactly the Composition of the Spine, we must consider it both in general and in particular. There are seven things to be examined in the general, its Name, its Definition, its Division, its Figure, its Connexion, its Uses, and its Parts. The Spine.

All the Bones which are from the first *Vertebra* of the Neck unto the Extremity of the *Coccyx*, are called the Spine; it is so named, either because of the Sharpness of its back-part, or else because if you separate entirely the *Vertebræ* from the other Bones which touch them, they will all together make the Figure of a Thorn. Its Name.

It is defined, a Complex of many Bones articulated, together to serve for a Habitation and Rampire to the Definition.

Marrow, as the *Cranium* is to the Brain. If it had consisted but of one Bone, it would have remained strait like a Stake, without possibility of bending, and if it had consisted but of two, three, or four Bones, it would have been forced to make right Angles in all its Flexions, at the Articulations, and that would have made a Compression on the Marrow, which would have hindred the Transition of the Animal Juice into the Extremities of the Nerves. But being composed of many Bones conjoined and articulated together by strong Ligaments, it easily moves in all its Parts without incommoding the Marrow which it contains, or either the Parts of the *Thorax* and *Abdomen*, which it touches.

Division. The Spine is divided into five parts, the Neck, the Back, the Loins, the *Os Sacrum*, and the *Coccyx*.

Figure of the Spine in general. The Figure of the Spine is one of the principal Circumstances we ought to observe in it; for if we behold it either before or behind, it appears direct or strait; but if we consider it on either side, we shall see that it falls one while inwards, and one while outwards, both for its better Support, and to remove from, or to approach to the parts of the *Thorax* and the *Abdomen*.

The particular Figure of the Neck. The sharp End of the Spine, at the Neck, bends inwards; and some pretend it is in order to support the *Aspera Arteria*, and the *Oesophagus*, which I do not believe, seeing the Proximity of many Bones so hard as are the *Vertebræ*, would rather hurt the *Oesophagus*, and hinder Deglutition, than be any Advantage to it. It is much more likely that this Position is given, for the better sustaining the Head, which is there placed as on a Pivot; for if the Spine had risen strait up, it would have been joined with the hinder-part of the Head, which being thereby not well supported, would have fallen forwards by its own Weight.

The Figure of the Back and the Loins. The *Vertebræ* of the Back, on the contrary, do incline or bend outwards, for the Augmentation of the Capacity of the *Thorax*, because the Heart and the Lungs which are therein contained, being in a continual Motion, ought not to suffer Compression. Those of the Loins do incline a little inwards, not for the Support of the great Artery, and the *Vena Cava*, as some have pretended, but for the better balancing the Weight of the Body, by serving for Buttresses to the

the Parts which they ſuſtain; for if they had bent outwardly, as do the *Vertebræ* of the Back, the Body which is ſupported by them, inſtead of forming an erect upright Figure, would have continually fallen forwards. The *Os Sacrum* bends outwards, in order to form the Cavity of the *Pelvis* more large, that the *Rectum*, the Bladder, and the Parts that ſerve for Generation may have the eaſier Poſition, and eſpecially thoſe Parts in Women which have need of room in the time of their Breeding. The *Coccyx* bends inward, that it may not be hurt, or uneaſy, when we do ſit, or mount on Horſe-back.

The General Connexions of the Spine.

That we may the better examine the Connexions of the Spine, we muſt obſerve thoſe which are common, and thoſe that are particular to it; the common Connexions are thoſe it has with the Parts that are joined to it; the firſt is with the Head, to which it is joined by *Arthrodia*, the *Os Occipitis* having two Prominences which do enter into the Glenoide Cavities of the firſt *Vertebra* of the Neck; the ſecond is with the Ribs, which are articulated with the twelve *Vertebræ* of the Back by a double *Arthrodia*, the one being made in the body of the *Vertebra*, and the other at its tranſverſe Proceſs; the third is with the *Scapula* by *Syſarcoſis*, there being ſome Muſcles which ſpring from the ſpiney *Vertebræ* of the Neck, and from thoſe of the Back, which have their Inſertion into the *Baſis* of the *Scapula*; the fourth is with the *Oſſa Innominata*, which are ſtrongly united with the *Os Sacrum*.

Particular Connexions of the Spine.

The Particular Connexions of the Spine, are thoſe which the *Vertebræ* do make one with another; they are of two or three kinds; one of them is made by their Bodies, which is a *Symphyſis* called *Syncondroſis*, becauſe the Connexion is made by means of a Cartilage; the other is made by their oblique Proceſs, which is an *Arthrodia*; a third ſort is added to them, which is a *Species* of *Ginglymus*, becauſe at the ſame time as a *Vertebra* is received by that which is inferior to it, it alſo receives that which is ſuperior to it.

The Ligaments of the *Vertebræ*.

The Ligaments, which are in the Articulations of the *Vertebræ*, are very ſtrong, in order to hinder their Luxation, in the violent Motions they make. They are of two ſorts; the one are thick and fibrous, made in the form of a Creſcent, which tie them both above and below; and the others, which are membranous,

do ſerve to faſten them more ſtrongly. They do riſe from the tranſverſe and acute Proceſſes.

Uſes of the Spine.

The Spine has Uſes that are common and particular to it. The firſt are to ſerve for a Prop and Support to the Body, as all the reſt of the Bones do, and alſo to ſerve for the Inſertion of many Muſcles: The ſecond are for the Conveyance of the Marrow, to defend it from all Injuries both Internal and External, and to be a Support to the Head, the Breaſt, the Ribs, the Legs and Arms; inſomuch that it may be ſaid to be like the Keel of a Ship, to which the Ribs, the Stern, the Fore-deck, and generally the whole Ship is faſtned.

Its Parts.

The Parts which compoſe the Spine are called Σπόνδυλοι, and commonly *Vertebræ*, from *Verto*, to turn, becauſe the Body turns ſeveral ways by their means.

What the *Vertebræ* have in common.

Before we ſhall examine the *Vertebræ* particularly, we ought to obſerve five things which are common to them all, and are to be found in the Structure of them all; the firſt is that each of them has its body in its Internal part, their Body is the largeſt Part of them, on which they do ſupport one another; the ſecond is, that they have all of them a great *Foramen*, through which the *Medulla Spinalis* paſſes; the third is, that they have all three ſorts of Proceſſes, to wit, four oblique, two tranſverſe, and one acute; the fourth is, that they have all of them five *Epiphyſes*, or Appendages, to wit, two at their Body, two at the Extremities of their tranſverſe Proceſſes, and one at the End of their acute Proceſs; the fifth and laſt thing is, that they are all pierced through on their ſides, for the Paſſage of the Nerves that come through them. We muſt obſerve, that they are not ſo pierced in their middle part, which would weaken them too much, but that two *Vertebræ* do contribute to make the Hole between them, ſo that in each of them there does not appear but one half of the Hole, the greateſt part of it being hid in the Cartilage, which ties two *Vertebræ* together.

In order to examine well each *Vertebra* in particular, we muſt reſume the Diviſion that I made of the Spine into five parts, the Neck, the Back, the Loins, the *Os Sacrum*, and the *Coccyx*.

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The Neck.

The Neck is compoſed of ſeven *Vertebræ*, which are more ſolid and harder than thoſe of the Back, becauſe their buſineſs is to ſupport the Head, which is a very weighty Part; but they are likewiſe ſmaller than the others, becauſe if they had been as big as thoſe of the

Back

Back and Loins, the Neck would have been too big, and it would not have been able to move so easily as it does.

Two or three of these *Vertebræ* have something particular to them, which I shall demonstrate after I have observed to you what they have in common to one another. I shall confine my self herein to five things that are remarkable. The first is, that besides the seven *Apophyses*, which I have said do meet in all the *Vertebræ*, these of the Neck have two more than the others, which makes their Number nine, the which are placed in the Superior Part of their Body, one on the right and the other on the left; they do encompass the body of the Superior *Vertebra*, which is small enough, and by hindring that does not slip either one way or t' other, they preserve it firm and certain in the Motions of the Neck. The second is, that the body of these *Vertebræ* is flatter before than that of the others, to the end they may not incommode the *Aspera Arteria*, nor the *Oesophagus*. Many Authors have thought that these *Vertebræ* have their Tendency forwards, to support those Parts; but it is not true, since they have no such need of the neighbourhood of these Bones, which if they were too near would not fail to injure them in their Functions, by compressing them too much. The third is, that their transverse Processes are pierced through, for giving Passage to the Cervical Arteries, which are conveyed this way into the Brain. The fourth is, that their Processes both transverse and acute are cleft or forked, to facilitate the Adhæsion of the Muscles. And lastly, the fifth is, that their acute Processes are a little couched in their lower part, for the Easiness of Motion.

The *Vertebræ* of the Neck have five things in common.

The first of all these *Vertebræ* is called the *Atlas*, because it immediately supports the Head, which being of a round Figure, has Resemblance to the World, which has been feigned to be born by *Atlas*. This *Vertebra* has no acute Process, because the Motions of the Head are not made upon it, but upon the second; and it being obliged to turn as often as the Head has a circular Motion, if it had had an acute Process, this would have incommoded the posterior Muscles of the Head in its circular Motions, and especially the two little right Muscles, which have their Rise from the second *Vertebra*, and their Insertion in the *Occiput*. This is of a more delicate and thinner,

C *Atlas.*

and alſo harder ſubſtance than the other *Vertebræ*. It likewiſe differs from the reſt, in that the others do receive on one ſide, and are received on the other: On the contrary, this does receive at both its extremities; for two Prominences of the *Occiput* do enter into its two ſuperior Cavities, which make its Articulation with the Head; and at the ſame time two other Prominences of the ſecond *Vertebra* do enter into its two inferior Cavities, which do join them both together.

Obſervation on the Articulation of the Head.

We muſt obſerve, That the Articulation of the Head is made on the anterior part of this *Vertebra*, and not on its poſterior part, to the end it may be the better ſupported by the body of the *Vertebræ*, and that it may be ſo kept the better in its *Æquilibrium*. We muſt alſo obſerve, that the Aperture which is in the middle of this *Vertebra*, is greater than that of the reſt; for beſides that it gives paſſage to the *Medulla Spinalis*, as all the others do, it receives the Tooth of the ſecond, which paſſing through its aperture, does unite it ſelf to the *Os Occipitis*.

D The Wheeling *Vertebra*.

The ſecond of the *Vertebræ* is call'd the Wheeling *Vertebra*, becauſe it is upon this that the Head and the firſt *Vertebra* do turn about as upon a Pivot, and becauſe from the middle of its body there does riſe a Proceſs, which repreſents in ſome meaſure a Tooth, which has alſo given it the name of *Dentata* at this Proceſs, whoſe Surface is ſomewhat unequal, that the Ligament which riſes from it, and which ties it with the *Occiput*, may faſten the better to it. It is likewiſe invironed with a ſolid and round Ligament, which has a curious fabrick, in order to hinder the *Medulla Spinalis* from compreſſion by this Proceſs. This *Vertebra* and the firſt are joined to the *Occiput*; and they are conjoined to one another by particular Ligaments, which tie them ſtrongly to the Head.

E The Axle-tree.

The third is call'd the *Axis*, or the Axle-tree, becauſe it is this that begins to form a Body on which the two former *Vertebræ*, and the Head, are ſupported, as on an Axle-tree; the four following *Vertebræ* have no particular names; it is obſervable only, that the laſt has no acute Proceſs forked like the others; and that this laſt begins to aſſume the figure of thoſe of the Back.

F The Back.

There are twelve *Vertebræ* that compoſe the Back; theſe are larger than thoſe of the Neck, and ſmaller than

than those of the Loins. We must observe, that they are not all equal, and that they do become larger and stronger, in proportion as they descend lower, for the same reason as that which bears ought to be stronger than that which is born; and besides, they all having a pyramidal figure, have the more strength from it. They have their Processes spiney, simple, and acute, which rest one upon another below: Their transverse Processes are very large, for the articulation of the *Costæ*, or Ribs, which are fastened to them; for each *Vertebra* of the Back does articulate two Ribs, both by its Body, and by its transverse Processes.

The first of these *Vertebræ* is called the Eminent, because it is higher than the rest; the second is call'd the Axillary, because it is nearest to the Arm-pit; the eight which follow are call'd the Costal, or the Pleuritical, because they do articulate those Ribs, which are inwardly invested with the *Pleura*. The Eleventh *Vertebra* of the Back is call'd the Direct, because its acute Process does not bend downwards to rest upon the next below, as do the others. The twelfth is call'd the Girdler, because it is situated in the place where the Girdle uses to be worn.

G The first of the *Vertebræ* of the Back.

H One of the last.

The Loins are composed of five *Vertebræ*, which are thicker and larger than those of the Back, because they do serve for a *basis* to them; their Articulations are not so close and compact as those of the Back, to the intent that the motions which the Loins are obliged to make, may be the freer, and that we may be able to stoop the more easily. They have their transverse Processes longer and finer than those of the Back, which serves there instead of Ribs, excepting only the first and the fifth of them, which have them shorter; and this is the cause that the *Vertebræ* of the Loins do never hurt any part in the motions and flexions which they make towards the Ribs. They have nine Processes; for those that are ascending, which do serve to articulate them together, are double: Lastly, They have their Spines thicker and larger, which serves to fasten to them the better the Muscles and Ligaments of the Back.

I The Loins.

The first of these *Vertebræ* is call'd the Nephritick, or Renale, because the Reins or Kidneys lie on the side of it, and because it is in this place that the Nephritick Pain begins to be felt: The three which follow have

L One of the *Vertebræ* of the Loins.

no

no particular name given them: The fifth is consider'd as the prop and support of the whole Spine, wherefore it is called Ἀσφαλτὶς.

M *Os Sacrum.* The *Os Sacrum* is a great, large and immovable Bone, that serves for a *basis* and pedestal to the Spine. I cannot tell the reason why it is so called; some say, it is because the Antients did offer it in Sacrifice to their Gods; others, because it is so very large; and others again, because it encloses the *Pudenda*. Its Figure. Figure is triangular; it is hollow within, which serves to form the cavity that is in the lower part of the *Hypogastrium*, call'd the *Pelvis*; it is smooth and equal on its anterior part, which hinders the parts contained in it from receiving any hurt; is it convex and unequal on its posterior part, which is a help to the better insertion of the Muscles.

Its Articulations. This Bone has three different Articulations; its first, which is with the last *Vertebra* of the Loins, is like unto that of all the other *Vertebræ*; the second is with the *Coccyx*, and is made by *Synchondrosis*; and its third is with the *Ossa Innominata*, by an indenting. Wherefore we must observe on the superior part of this Bone two ascending Processes, each of which has a Glenoide Cavity that receives the descending Processes of the last *Vertebra* of the Loins, and which makes the first Articulation; also on its inferior part two small descending Processes, which are joined to the *Coccyx*, and which make the second; and again, on its lateral parts many intricate *Sinus* interlaced with Prominences, which receive and are received of the *Ossa Innominata*, and do make the third Articulation.

N The fore-part of the *Os Sacrum.* The Parts which do compose the *Os Sacrum* are reckon'd among the *Vertebræ*, not for their having the same Use, but the same Resemblance. The *Os Sacrum* is divided into five *Vertebræ* of a different bigness, of which the superior is the biggest; they lose in bigness, in proportion to their descent, for the last is the least of them all. These *Vertebræ* are easily separated from one another in Infants, because the Cartilages which conjoin them, not being become boney, break asunder in the boiling; but in adult Persons they are so strongly united, that they do make but one Bone, which indeed ought to be very solid, for the support of the whole Spine, and to articulate so strongly as it does the *Ossa Innominata*.

It

It is at the *Os Sacrum* that the Cavity ends, which conveys the *Medulla Spinalis*. We must observe, that the Holes which are in it for transmission of the Nerves, are not situated laterally, as they are in the other *Vertebræ* but before and behind; because being articulated on its sides with the *Ossa Innominata*, it could not suffer there, by reason of its Holes. The Holes before are greater than those behind; and it is through the former that the last pair of Nerves does come forth of the *Medulla Spinalis*, and distribute themselves into the anterior parts of the Thighs and Legs. There's nothing that comes through the Holes behind, because they are stopt or filled with a membranous Tendon. Its transverse Processes are very small, which is the cause that they give no inconvenience to its Articulation with the *Ossa Innominata*.

O The hinder part of the *Os Sacrum*.

This Bone has five Uses; the first is to serve for a prop and support to the Spine; the second to contain the parts of the *Hypogastrium*, by forming a Capacity proportionable to their Magnitude; the third is to defend them; the fourth, to articulate the *Ossa Innominata*; and the fifth is, to give origin and insertion to many Muscles.

The Uses of the *Os Sacrum*.

The *Coccyx*, or Rump-bone, is the last extremity of the Spine; it is so called, because it resembles the Beak of a Cuckow; it is situated at the end of the *Os Sacrum*; it is composed of three Bones, of which the greatest does touch the *Os Sacrum*; the second is less than the former; and the third, which is very small, is that to the end of which is fastened a small Cartilage. They are all three joined together by a very loose connexion, which makes them pliant, and to draw back easily behind.

P The *Coccyx*.

In Women these Bones do jet outwards, more than they do in Men; because they have need for a greater Cavity, to inclose the *Matrix*, and to contain the Infant during their being big with Child. The end of these Bones does always bend inwards, that it may be no inconvenience in Sitting; but they draw backwards a little, for the better extrusion of the Excrements; and they do so in Women, in time of Delivery, to open the greater passage to the Infant.

Q The *Coccyx* represented before.

R The *Coccyx* behind.

I have now endeavoured, GENTLEMEN, to omit nothing which regards the SPINE, and all its Parts; that

that the Surgeon being throughly instructed in its true Conformation, may be able to preserve it in its natural state; which is not always easie for him to do. For it being composed of many Bones united together, it often happens that it falls sometimes too much inwardly, and sometimes outwardly, and sometimes towards the Ribs: And then it causes not only a great Deformity to the Body, but also sometimes occasions Death it self; because it makes a compression on the Heart and the Lungs, and hinders the *Medulla Spinalis* from destributing the Animal Juice to all the Parts.

I shall entertain you, in my next Demonstration, with the Bones of the *Thorax*, and with the *Ossa Innominata*.

Of the BONES *of the* Thorax, *and those of the Hips, called the* Ossa Innominata.

The Sixth Demonstration.

AFTER having shewn you, Gentlemen, the first Bones of the Trunk of the Body, which are those of the *Spine*; it remains that I should Demonstrate to you those of the *Thorax*, and the *Ossa Innominata*.

The Brain and the Heart have functions so noble, and so necessary to our Life, that Anatomists have not yet been able to decide which of these two Parts ought to have the preheminency of the other. But without perplexing our selves in this intricate Question, I shall follow the Order I have proposed; and we shall find, in the examination of the *Thorax*, that its Composition is no less worthy of our Admiration, than was that of the *Cranium*: It is partly Boney, and partly Fleshy; because it not only serves to contain and defend the Heart and the Lungs, but has need of expanding and contracting it self according to the motion of these Parts.

Structure of the *Thorax*.

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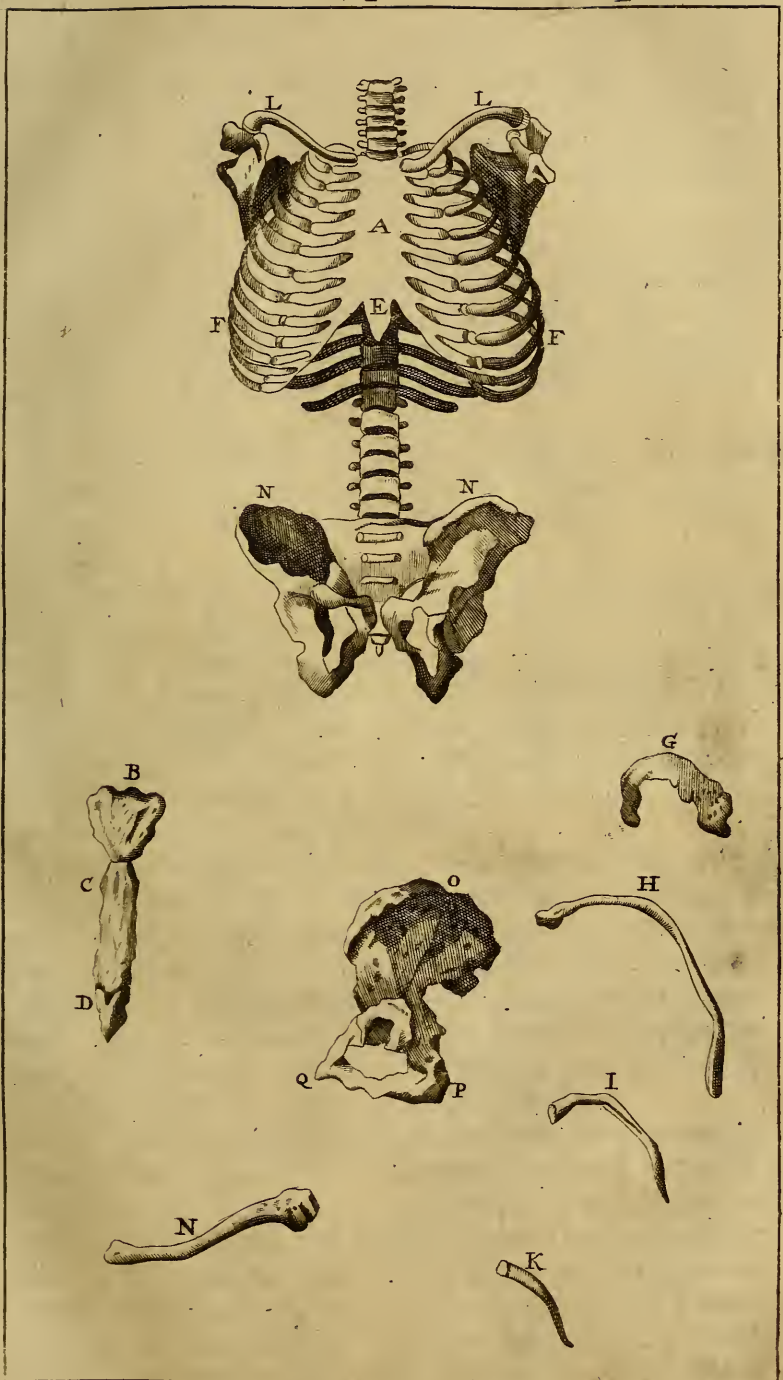
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The Breaſt (which is alſo call'd the *Thorax*, ἀπὸ τῆς θορῆς, h. e. *ſalio*; becauſe the Heart, which it encloſes, does never ceaſe to beat) is of an oval Figure, eſpecially when the *Diaphragma* moves downwards. It is terminated above by the Clavicles, before by the *Sternum*, behind by the *Vertebræ* of the Back, on the ſides by four and twenty Ribs, and below by the Cartilages of the *Coſtæ Nothæ*, and by the *Cartilago Xiphoides*, to which is joined the great Muſcle call'd the *Diaphragma*. The figure of the Breaſt.

It was neceſſary that this Cavity of the Breaſt ſhould be great, large and deep, to the end the Parts contained in it ſhould be able to move with more facility: And it is obſerved, that thoſe who have it greatly extended, do live much longer than thoſe who have it ſmall and narrow. Magnitude of the Breaſt.

The Bones which compoſe the *Thorax* are the *Sternum*, the Ribs, and the Clavicles. I am now going to Demonſtrate them unto you, as well as the *Oſſa Innominata*. Diviſion of the Breaſt.

The *Sternum* is all that anterior part of the *Thorax* which above touches the Clavicles, and ends below at the *Cartilago Xiphoides*, and laterally both on the right and left is joined to the ends of the Ribs before. Its body does proceed forward, but bends towards the Ribs, in order to form the round and oval figure of the Breaſt, on which it is, as it were, couched, which has cauſed it to be called *Sternum*. A The *Sternum*.

To know well the Subſtance of the *Sternum*, we muſt examine it according to the different Ages. In Infants it is wholly Cartilaginous, excepting only the firſt Bone, into which the Clavicles are annexed: In Old People it is wholly Boney, and even the Cartilages which join it with the Ribs can hardly be ſeparated with a Knife; but in thoſe of a Midling Age it is found to be partly Boney, and partly Cartilaginous. The Subſtance of the *Sternum*.

I have told you, that in Infants the *Sternum* was wholly Cartilaginous, and that it did not grow hard but only with Time, the ſuperior part of it turning boney ſooner than the middle, and the middle ſooner than its inferior part. The exact number of the Bones of the *Sternum* cannot be determined, until they become perfect Bones; for in ſome Infants there have been found eight, which by growing together after ſeven years old, do come to be but four, and commonly but three. That the *Sternum* grows boney after the Birth.

Some

Some Authors have fixed their number to be Seven, becauſe between every ſpace of the Ribs a little line is to be ſeen, which ſeems to ſeparate the *Sternum* into ſo many Bones as there are Ribs which articulate with it. But I ſhall continue in the number of Three, which is that number which is commonly found in it.

B The First Bone of the *Sternum.*

The Firſt of the Three Bones of the *Sternum* is the ſuperior of them, it is larger and thicker than the reſt, its upper part is ſomewhat like a little Creſcent; and I believe it is on this account that ſome have called it the Upper Fork. On each ſide of its ſuperior part a *Sinus* is ſeen, that receives the head of the Clavicle, with which it is joined by means of a Cartilage: It has likewiſe another Sinuous Cavity in the middle of its internal and ſuperior part, which makes room for the *Trachea.*

C The Second Bone of the *Sternum.*

The Second of theſe Bones is placed under the former; it is ſtraiter and thinner, but it is longer. There are divers *Sinus* to be ſeen on both its ſides, which receive the Cartilages of the Ribs that articulate in them.

D The Third Bone of the *Sternum.*

The Third is ſtill leſs in length than the Second, but it is thicker; it is found under the two former; it ends at the *Cartilago Xiphoides*, ſo called becauſe it is ſharp like the point of a Sword.

E The *Cartilago Xiphoides.*

This Cartilage is commonly triangular, and oblong; ſometimes it is round, and at other times divided in two, which has cauſed ſome to call it the Fork. Whenever it ſinks inwardly by ſome ſtroak, or by ſome fall, it occaſions Vomiting, which ceaſes not until it is reſtored to its proper place. This Cartilage ſerves to defend the Stomach, to tie and faſten the *Diaphragma*, and to ſupport the Liver before, by means of a large Ligament that is tied unto it.

Its Uſe.

Its Articulation.

Theſe three Bones are joined together by Cartilages, which do fill up the middle ſpaces, and ſerve inſtead of Ligaments to them: They do likewiſe form a Cavity which appears outwardly, and which ſome do call the Pit of the Heart.

All its Uſes.

The Uſes of the *Sternum* are four: The firſt is for the forming the anterior and middle part of the Breaſt; the ſecond is to join and articulate the *Coſtæ* and the Clavicles; the third is to contain and defend the Heart, and the Parts for Reſpiration; and the fourth is to faſten all along its middle and internal part to the *Mediaſtinum*,

Mediaſtinum, which is a Membrane that ſeparates or divides the Breaſt into two parts.

The *Coſtæ*, or Ribs, have been ſo called, becauſe they are placed on the ſides of the Breaſt, whoſe two Sides they do form, both on the right and left. FF The Ribs.

We ſhall be perfectly inſtructed in all that regards the *Coſtæ*, after we ſhall have examined their Subſtance, their Figure, Connexions, Number, Parts, and Uſes. Six things to be examined in the Ribs.

The Subſtance of the Ribs is partly Boney, and partly Cartilaginous: That end of the Rib which is articulated with the *Vertebra*, being ſlenderer than that which is joined to the Breaſt, is of a harder ſubſtance, that it may be the leſs ſubject to be fractured; the other extremity, on the contrary, is of a more ſpungy ſubſtance, and the middle part of it has a middling nature between the two ends, both in reſpect of Subſtance and Bigneſs. Their Subſtance.

All the Ribs in their anterior part do end with Cartilages, which are to them inſtead of *Epiphyſes*, and which ſometimes do become ſo hard, with age, that they cannot be ſeparated from the *Sternum* with a Knife. And it is obſerved, that the Cartilages of the ſuperior Ribs are harder than thoſe of the inferior, becauſe they are immediately joined to the *Sternum*; whereas the others are not conjoined to it but by other Cartilages, and conſequently are more obliged to comply with the motions of the Breaſt.

The Figure of the Ribs is a Semi-circle, or a Creſcent, if you conſider but one of them at a time; but if you examine two of them together, as they lie in a Skeleton, they do make a compleat Circle: They are of a concave figure within, to form the capacity of the Breaſt; and convex without, for the better reſiſting Accidents: The farther they are diſtanced from the *Sternum*, they become the more narrow and round; but they flatten and become larger, according as they do approach unto it. They are not all alike great; for the ſuperior are ſhorter, the middle Ribs are the greateſt of all, and the inferior are very ſmall. Theſe different Magnitudes were neceſſary in Nature, for the formation of the Arch of the Breaſt; and although the ſuperior and the inferior Ribs are the ſmalleſt, yet theſe do alſo differ from one another, in that the ſuperior are larger than the inferior Ribs. F The Ribs.

The

Connexion of the Ribs.

The Ribs are articulated with other Bones at both their Extremities, at their anterior Part with the *Sternum* by *Synchondrosis*, and at their posterior part with the *Vertebræ* by *Arthrodia*; this last Articulation is double, in the seven first Ribs, one of them is made with the body of the *Vertebra*, and the other with the transverse Process; for the five lower Ribs are only joined by a Simple Tuberosity or Prominence.

Number of the Ribs.

The Number of the Ribs seldom varies: it is always that of twenty four, twelve on each side; they are divided into True, and False Ribs. The True are the seven Superior, and are so called, because they do finish the Circle more perfectly than the rest, and because they do touch the *Sternum*, with which they have a strong Articulation: the two first on each side, reckoning from above, are named the crooked, the two next the solid, and the three others the Pectoral Ribs. The five last Ribs are called False, because they are smaller, softer, and shorter than the others, and because they do not reach the *Sternum*, which occasions them to have but a very loose or slack Articulation. They are fastned to the *Vertebræ* behind, but before they terminate in long and soft Cartilages, which bend upwards, and are united so fast to the Superior *Costæ*, as if they were glewed to them, except the last, which being the smallest of all, has no Adhesion before to any other.

G One of the first Ribs.

H A great Rib.

I A smaller Rib.

K A False Rib.

The Parts of the Ribs.

In the Ribs two kind of Parts are considered, their Body, and their Extremities; that which makes the middle and Principal Part of them, is called the Body. Their Superior Part is also remarkable, having two Lips, the one Internal, and the other External, unto which the Intercostal Muscles are fastned; and so is their Inferior Part, which has likewise two Lips, that are separated by a *Sinus* along the Rib, which *Sinus* disappears, according to the Length it removes from the *Vertebra*. This *Sinus* does serve to lodge the Artery, and the Intercostal Veins, the Extremities being double, the one joins the *Sternum*, and the other the *Vertebræ*, as I have shewn them to you. At the Anterior Extremity there is a small Cavity in the End of the Rib which serves to receive the Point of the Cartilage, which is there by this means more strongly united, than if it had only lain upon it: and at the other Extremity, besides its double Articulation by *Arthrodia*,

dia, there is likewise a Ligament which ties and fastens it with the *Vertebra*.

The Ribs do serve for three purposes: first to form the Capacity of the Breast; secondly to defend the Parts which they include; and lastly to give Origin and Insertion to many Muscles. Their Uses.

The *Clavicles*, or Channel-bones, are so called, because they are like Keys which shut the Superior Part of the *Thorax*, or else because they do fasten the Shoulder with the *Sternum*. Besides, the Arms have no other Bones but these to fasten them unto the Breast. L L The Clavicles

They are two of them, one on each side, they have a transverse Situation at the lower part of the Neck, and the upper part of the Breast, a little above the first Ribs; they are articulated at both Ends, of which one is joined to the Superior Process of the Shoulder, by a large and oblong head, and this by means of a Cartilage which nevertheless does not adhere to it, to the Intent that it may yield a little in the Motions of the Arm and Shoulder, but which is fastned only by Ligaments that involve the Joint; and the other End is joined with the *Sternum*, as I have already said. Besides these two Articulations, there is often found a third, which is made of it with the two first Ribs, by two small Prominences, of which one rises from the Superior Part of the Rib, and the other from the lower part of the *Clavicle*, and which are conjoined by means of a small Cartilage. Articulations of the Clavicles.

The Substance of the *Clavicles* is thick, but porous and fungous, whence it is that they are often fractured, and when a Fracture does happen, their Re-union and *Callus* are sooner made, than in other Bones. Their Substance.

Their Figure is like unto that of a ∫ made of two Semicircles conjoined and opposite one to the other; it is convex outwardly towards the Neck, and a little concave inwardly, that the Vessels which are under them, may not suffer Compression. It is observed that Men have them more bent, for which reason it is that they have their Arms more free for Extension. On the contrary, Women having them straiter, have not the same Agility with their Arms, nor can they throw a Stone with the same Strength as Men; but this little Defect of theirs is supplied by the Beauty of their Neck, which is longer, smoother, and more free from Wrincles and Cavities than those of Men. N One Clavicle alone.

The Uſes of the Clavicles.

The *Clavicles* are aſſiſtant to the different Motions of the Arms, which do move more eaſily forwards and backwards, by reaſon they are ſupported on theſe Bones as upon a *Baſis*. They are likewiſe of great uſe to hinder the Arms from too great an Extenſion forwards; and for this reaſon thoſe Animals which have occaſion for their Superior Extremities to move forwards, have no *Clavicles* at all.

NN

The Hip-bones, or *Oſſa Innominata*.

The laſt of the Bones which I am now to demonſtrate to you, are thoſe of the Hips, or *Oſſa Innominata*, which do form the laſt part of the Trunk of the Body. They are called *Oſſa Innominata*, or Bones without a Name, becauſe taking them all together they have no particular Name, but when they are divided into Particulars, they have every one a Name which diſtinguiſhes them from one another, as you will preſently ſee.

Articulations of the Hip-bones.

The Hip-bones are two, one on each ſide, ſituated at the lower part of the Trunk; they are articulated, at their poſterior part, with the *Os Sacrum*, and on their lateral parts with the *Femur*; the firſt of theſe Articulations is made by *Ginglymus*, for many ſmall Prominences in both theſe Bones do enter into Cavities proportionable to their Bigneſs, inſomuch that theſe Bones do receive, and are reciprocally received. The ſecond is made by *Enarthroſis*, for the head of the *Femur*, which is very big, is received by a great Cavity that is on the lateral and external part of theſe Bones. There is obſerved at the bottom of this Cavity a ſmall Inequality, at the very place where the Ligament is inſerted, which by tying ſtrongly in its place the head of the *Femur* does hinder it from Luxation, unleſs upon very great Efforts, ſuch as do uſe to cauſe Luxation of this Part.

Women have theſe Bones more extended.

When theſe Bones do come to be examined nicely in a Skeleton, we do eaſily find that there is a Difference between thoſe in Men, and thoſe in Women; they are ſtronger and ſmaller in Men, and greater and ſlenderer in Women; inſomuch that the Cavity which is called the *Pelvis*, and the which is formed by theſe Bones, and the *Os Sacrum* together, is much greater in the Skeleton of a Woman, , becauſe it not only contains the *Rectum*, and the Bladder, as it does in Man, but alſo the *Matrix*, which has need of a great deal of room, eſpecially in Child-bearing.

Their Uſes.

Theſe Bones do ſerve for the Inſertion of Muſcles, and for a Support unto all the Body, as all the other Bones

Bones do. But beſides theſe common Uſes, they are alſo uſeful for tying the Inferior Extremities with the Trunk, for bearing up and ſupporting the Spine, for helping to form the Capacity of the *Abdomen*, and to ſerve for a *Baſis* and Couch to the Parts contained in the *Hypogaſtrium*.

The Hip-bones conſiſt of three different Bones, which are joined together by Cartilages, that grow drier with Time, until they become ſo bony, that they ſeem to make but one Bone with the others in Adult Perſons. Theſe Cartilages do ſtill remain ſuch until about the Tenth or Twefth Year of Age; and then their Nature is not ſo defaced, but that there remain ſome footſteps of them, or ſome Signs by the means of which theſe Bones may be divided into three, which are the *Os Ilium*, *Os Iſchium*, and *Os Pubis*. The Hip-bones divided into three.

The *Os Ilium* is ſo called, becauſe it contains the Gut *Ileum*; this Bone offers it ſelf firſt, becauſe it is the greateſt; it is alſo ſituated above the others; its Articulation is made with the *Os Sacrum* by *Ginglymus*, which is ſtrengthened by a Cartilage, and by a Membranous Ligament that is very ſtrong. *Os Ilium.*

The Figure of this Bone is ſemi-circular; we muſt here conſider its two Appearances or Surfaces, the one Internal, which is filled with one of the *Muſculi Flexores Femoris*, called the *Flexor Iliacus*, by reaſon of the place it poſſeſſes; and the other External, where the *Muſculi extenſores Femoris* are inſerted, which are called the three *Glutei*. Its Figure.

That which is between theſe two Surfaces is the *Coſta*, which is bordered with two Lips, of which one is likewiſe Internal, and the other External; the two Extremities of this Rib do end with two Prominences, called Spines, of which the Superior is much greater than the Inferior. Near to this laſt, which is placed before, is ſeen an Indenting or Notching that facilitates the Paſſage to the Tendons of the *Muſculi Iliaci*, and *Pſoas*, and to the Crural Veins and Arteries, and to the Spermatick Veſſels.

And that we may forget nothing which ought to be examined in this Bone, you may obſerve that with its Inferior Part, it forms a part of that Cavity which receives the head of the *Os Femoris*.

I have already ſaid that this Bone was made larger in Women than Men, becauſe there was need of the Magnitude of the *Os Ilium*.

Infant's being well ſupported in the *Matrix*; and this is the cauſe alſo that Women with Child do often feel in this part a Pain that is occaſion'd by the Weight of the Infant.

P *Os Iſchium.* The *Os Iſchium* is the ſecond of thoſe Bones which compoſe the Hips. In it three Parts are to be conſidered; the Superior does make the greateſt part of the *Cotyla*, the Anterior makes a part of the *Foramen Ovale*; and the Inferior is that in which two Proceſſes are obſerved, the one Poſterior, called the Spine-proceſs, and the other Anterior and Inferior. There is likewiſe ſeen a *Sinus*, or Cleft, which gives a Paſſage to the Tendon of the *Obturator Internus*.

Articulation of the *Os Iſchium.* This Bone is annexed to the *Os Sacrum* by a double Ligament that riſes from it; one is inſerted in the acute Proceſs of the Hip, and the other behind at its Appendage, which ſerves to ſupport the *Rectum Inteſtinum*. Its Extremity is called the tuberous part of the *Iſchium*, which gives Riſe to the Muſcles of the *Penis*, the *Levatores Ani*, and many of the *Flexores Femoris*.

Q *Os Pubis.* The *Os Pubis* is the third and laſt of the Hip-bones, it is alſo called *Os Pectinis*; it is ſituated at the middle, and anterior part of the Trunk. It has four different Parts to be examined; the Anterior, which is joined by *Synchondroſis* with its fellow, by means of a Cartilage; the Poſterior, which being the Extremity behind the Spine, does form one part of the *Cotyla*: It is between this Part, and the Extremity of the *Os Ilium*, that the *Sinus* is placed, through which the Tendons of the *Muſculi Lumbares*, and *Iliaci* do paſs; the Superior Part, otherwiſe called the Spine, is that in which the Muſcles of the *Abdomen* are inſerted; and laſtly the Inferior is that which is joined with a Prominence made by the tuberous part of the *Iſchium*, both which Prominences do make the *Foramen Ovale*, otherwiſe called *Tyroides*, into which Prominences many Muſcles are inſerted. This Hole is intirely ſhut by a very ſtrong tedinous Membrane, to which are annexed the *Muſculi Obturatores*, which ſerve to move the Thigh ſemicircularly inward or outward. A Famous Anatomiſt has told us, that this great *Foramen* of the *Os Pubis* has no other uſe, but to leſſen the bulk of the *Os Innominatum*. But without deſiring to contradict him, another Uſe for it may be aſſigned. It is this which

ſerves

ſerves to facilitate the Motions of the *Obturatores*; For if we Examine well after what manner they are faſtned againſt this hole, we ſhall find that they would not have been able to act, if they had been poſited on a *Superficies* that was altogether flat and bony, which would have given them too much reſiſtance; whereas they having nothing to reſiſt them, they can both of them abbreviate themſelves by ſinking in the middle, for the thruſting inwardly or outwardly, the which they would otherwiſe never have been able to do, if there had not been a Vacuity behind.

The *Oſſa Pubis* are ſlenderer and larger in Women than in Men; and thoſe Women who have them advanced more outwardly, do undergo their Labour the more eaſily. The Bones of the *Os Pubis* ſlenderer in Women.

I ſhall finiſh, GENTLEMEN, this Demonſtration, in relating to you two different Opinions, concerning the Articulation which the *Oſſa Pubis* have with one another. *Bartholin* pretends, that they do ſeparate aſunder in the Time of Delivery, nay that they can be divided with the back of a Knife, in Women newly Delivered, which cannot ſo eaſily be done another time. Thoſe who are of the contrary Opinion, which is the true, do maintain that theſe Bones being once joined, as they are, cannot ſeparate aſunder during the Delivery; and that if there has been found ſome Women, in whom they have been eaſily ſeparated, it was the pure Effect of their natural diſpoſition, ſome perſons poſſibly having had the Articulations of them more looſe than others, and not upon the account of the Delivery. For I have opened and diſſected many Women that were newly brought to Bed, in whom nevertheleſs I was not able to ſeparate them without a great deal of pains. The Authority of ſo famous an Anatomiſt, as was *Bartholin*, has cauſed this opinion to ſpread; but I am obliged to aſſure you, that both He, and thoſe who follow Him, are miſtaken in this matter. Whether the Bones of the *Oſſa Pubis* do ſeparate in the Delivery. An Obſervation that they do not ſeparate.

We muſt alſo obſerve, that the Cartilage which joins the two *Oſſa Pubis* together, is of a Subſtance capable of plying. Wherefore in hard and painful Labours, it may well happen that this Cartilage may be diſtended a little; but to believe it is that alone which facilitates the Delivery of the *Fœtus*, is to forget that which is moſt conſiderable. Know we not Another Remark.

that the Head of a *Fœtus*, in time of Labour, is so soft that it can easily change the magnitude of its figure? and the same thing may be said of his Breast, and of his Hips: so we see from thence, that it is rather the great change of Figure, which happens to these three parts, that gives a free egress to the *Fœtus* through or out of the *Pelvis*, which can be but little aggrandized by the extension of the Cartilage of the *Os Pubis*, which Cartilage cannot yield above three or four lines at most.

Of the BONES *of the* HANDS.

The SEVENTH DEMONSTRATION.

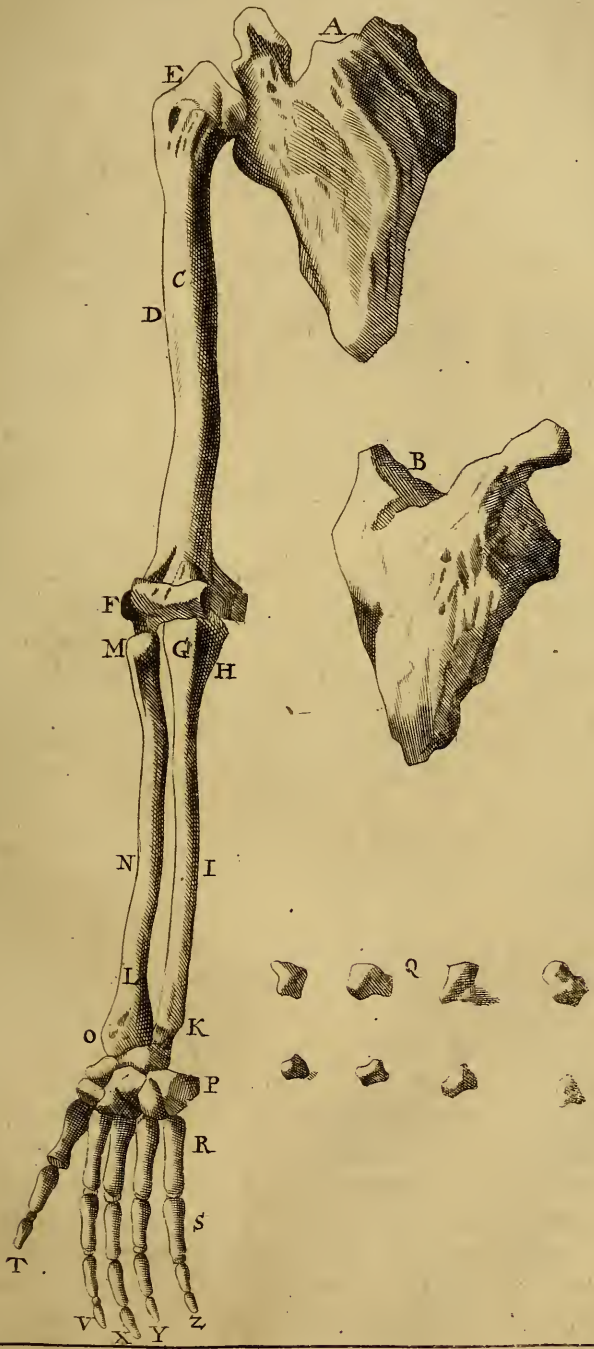
I Have shewn you, GENTLEMEN, all the Bones of the two First Parts of a Skeleton: It now remains, that I should let you see those of the Extremities, with which I shall finish my *Osteology*.

Two sorts of Extremities.

These Extremities are Superior and Inferior; both the one and the other are like so many Branches springing from the Trunk, and growing to it: The first are the Hands, and the second the Feet. In this Demonstration I shall shew you the Bones of the Hands, and in my next those of the Feet.

An Elogium upon the Hand.

Although there is not a Part in the Body but deserves Admiration; yet we must agree, that the Hand deserves it above all other Parts. And Authors have done it but justice, and especially *Aristotle*, when they have call'd it the Organ of Organs, and the Instrument of Instruments. And if there be something very particular, that Nature has given to every Animal, either to defend it self against others, or to preserve it from outward Accidents or Injuries, we may affirm, that Man has received two things preferably to all Animals, that is, Reason, and the Hand; the one for Council and Conduct, and the other for Execution. The first of them distinguishes him, and exalts him far above all other Animals; it is this which gives him dominion over them all, which conducts all his Actions, and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and which, by the Invention of all Arts, does enable him to make good Uſe of them. Nevertheleſs, all theſe Advantages would have been of little Uſe to Man, if he had not had Hands to execute what Reaſon dictates to him, and to make benefit of all that the Author of Nature has provided in his favour. Theſe are the Parts which make all ſorts of Arms for his defence, and to maintain his Maſtery over all the Animals; theſe do form thoſe Veſtments which are to ſupply the defect of Hair, and Feathers, which Nature hath cloathed the others with. Laſtly, It is with them that we practiſe the Art of Surgery, an Art ſo noble in it ſelf, and ſo neceſſary for Life.

The two Hands, why neceſſary.

The Action of the Hand is Apprehenſion; and Man has two Hands, to perform it the better. We muſt obſerve, that all the Joints of the Arms and Hands do bend inwardly, to the end they may embrace any thing the better, and that they may mutually aſſiſt one another in their Actions, which could not but have been imperfect with one Hand alone.

That Man does naturally uſe both Hands alike.

All Men, and even Infants, are naturally diſpoſed to make uſe of both Hands alike; and if there be ſome of them who uſe the Right Hand rather than the Left, we ought to think it proceeds only from a Cuſtom which they have contracted, and becauſe they are taught to take things with that Hand, and not becauſe there is more Heat on that ſide, which has enclined them rather to uſe that Hand than the Left; ſince many of thoſe Perſons who have not been ſo taught, do of themſelves uſe ſometimes the Right, and ſometimes the Left indifferently; and when they are grown up, they cannot get rid of this Cuſtom.

Diviſion of the whole Arm.

Theſe Superior Extremities, which are the Subject of this Demonſtration, are divided into three parts, the Arm, the Cubit, and the Hand; the Arm conſiſts of one Bone only, the Cubit of two, and the Hand of ſeven and twenty. We will examine them all in their turn, after that we have firſt conſider'd the *Scapula*, or Shoulder-blades, which were comprehended in the number of ſixty two Bones that compoſe the Arms.

A The *Scapula* ſhewn on the Inſide.

The *Scapula*, or Shoulder-blade, is the Bone that forms the Shoulder; it is defined a large and ſlender Bone, eſpecially in the middle, and thick in the Proceſſes; it is ſituated at the poſterior part of the ſuperior Ribs, where it ſerves inſtead of a Buckler to them.

We must observe four things in it, its Figure, Connexions, Parts, and Uses.

B

The *Scapula* shewn on the Outside.

The Figure of the *Scapula* is Triangular; of which two Angles are posterior, and the third anterior. It is convex without, and concave within, both for its better apposition on the Ribs, and for containing a Muscle, of which I shall speak by and by.

Its Connexions.

It has three sorts of Connexions, one by *Arthrodia* with the *Humerus*, having at its anterior angle a glenoide cavity, which receives the head of the *Humerus*; this Cavity is covered over with a Cartilage that facilitates the motion; and it has a ligamentous brim, which by making the cavity deeper, and embracing the head of the *Humerus*, does strengthen its Articulation: The other is made by *Synchondrosis* with the Clavicle, by means of a Cartilage that unites this Bone with the Clavicle: And the third is made by *Sysarcosis* with the *Vertebræ* and the Ribs; there being nothing but Muscles in all the posterior part that unite it with the adjoining Bones.

The Parts of the *Scapula*.

The Parts to be considered in this Bone are many: We will begin with its *Basis*, which is its posterior part, and next to the *Vertebræ* of the Back. This *Basis* doth end with two Angles, of which one is called the Superior Angle, and the other the Inferior: The Parts which come from these Angles towards its Neck are called the *Costæ* of the *Scapula*, of which there are also two; the one is call'd the Upper *Costa*, which is the slenderest and shortest; and the other the Lower *Costa*, which is the thicker and the longer.

The two Surfaces describ'd.

The two Surfaces of this Bone do differ one from the other; the Internal is hollow, to lodge the Scapular Muscle; the External is elevated, to form a considerable Eminence, which from the bottom of the *Basis* does rise strait upwards; it is call'd the Spine of the Shoulder-blade, whose end is called *Acromium*, because it resembles an Anchor. Some have pretended that it was a different Bone from the others, because during the Infancy it is only a Cartilage, which grows Boney by little and little; and after twenty years of age becomes so hard, and so united to the rest of the Spine, that it appears one and the same Bone.

On each side of this same Spine there are two Pits, one above, called *Fossa Supra-Spinata*; and the other underneath, called *Fossa Infra-Spinata*, which is greater than

than the former; becauſe, beſides the *Muſculi Infra-Spinati*, it contains ſome more Muſcles, which do ſerve for the motion of the Arm; and in the middle of the Spine there is a crook'd Eminence call'd the Creſt, or the Wing of a Batt, by reaſon of its reſemblance.

The Proceſs which is placed at the ſuperior part of the Neck, and which advances above the head of the Shoulder-bone, is called *Coracoides*, becauſe it is like the Bill of a Raven: This ſtrengthens the Articulation of the Shoulder, and gives riſe to one of the Muſcles of the Arm, that is therefore named *Coracoides*. *Apophyſis Coracoides.*

We muſt ſtill obſerve two Cavities more, one of which is between the Neck and the *Acromium*, and the other between its Superior *Coſta* and the *Apophyſis Coracoides*, they do both ſerve for the paſſage of Veſſels; and laſtly, the Concavity which is at the end of the Exterior Angle, is call'd the Glenoide Cavity of the *Scapula*, of which I have already ſpoken.

The Shoulder-blade has many Uſes; it gives origine and inſertion to the Muſcles, as all other Bones; it faſtens the Arm to the Body; it ſerves for a ſupport to the Arm, that it may more conveniently make its motions; it makes the Shoulder, and defends the internal parts with its bulk or largeneſs, which covers the Ribs. The Uſes of the *Scapula.*

C

The Arm is compoſed only of the *Humerus*, or Shoulder-bone, which is the greateſt and ſtrongeſt Bone of all the whole Arm. In order to know it well, we muſt examine its Connexions, and its Parts. The *Humerus.*

It is Articulated at both its ends; the upper end is with the *Scapula* by *Arthrodia*, as I have ſhewn you already; and the lower part is doubly joined by *Ginglymus* with the *Cubitus*, and by *Arthrodia* with the *Radius*. We muſt obſerve, that the *Ginglymus* is here perfectly made, theſe two Bones of the *Cubitus* and *Humerus* reciprocally receiving at the ſame end, and having both of them Prominences and Cavities which form this Articulation. The *Humerus* is alſo joined with the *Radius* by *Arthrodia*, having a Prominence at its end, which is received into the Cavity that lies at the end of the *Radius*; it is this Articulation that cauſes the motions of the *Cubitus* inwards and outwards, called by ſome Pronation and Supination. Articulations of the *Humerus.*

That we may examine the Parts of the *Humerus*, we muſt divide it into its Body, and its Extremities;

mities; and these are two, the one Superior, the other Inferior.

D The Body of the *Humerus* is long and round; it has an Internal Cavity all its length, and which contains the Marrow; its Figure is not absolutely straight, but a little hollow on the inside, and raised on the outside, for the strengthening of it in its Actions. In it there is observed a Line which descends and terminates in two *Condyli*; this serves to fasten more strongly the Muscles which are inserted in this Bone.

The Body of the *Humerus*.

E The Upper-end of the *Humerus* is much larger, and more spungy than the Lower; it contains a Medullary Juice. This part is call'd the Head: It is not only invironed on all sides with Ligaments and Membranes, which come from the Glenoide Cavity of the *Scapula*, but it is likewise involved with four *Aponeuroses* of the Muscles that compass it. A little from under this Head there is a part that is round, and a little strait, call'd the Neck; and at the fore-part of this Head there appears a pretty long cleft, which goes to the middle-part of the Bone; it is made like unto a Gutter, to make room for one of the Tendons of the *Musculus Biceps*.

The Upper-end of the *Humerus*.

F The Lower-end of this Bone is smaller, flatter and harder than the other; it is also bigger, because it is joined with the two Bones of the *Cubitus*, which are placed on the side of one another, and which have two different motions. In this place we see three Processes, and two Cavities: The first of the Processes is the Superior, which is the larger, it is a round head which articulates with the *Radius*: The second is the Inferior or Internal, it is smaller than the former, and called *Apophysis Condyloides*; it does not articulate with any Bone, because it only serves for the origin of the *Musculi Flexores* of the Hand. In the middle of these two *Condyli* is a third Process that is smooth, oblong, and made in form of a Pully, round which the *Cubitus* has its motions: The two Cavities are near this Process, one is internal and smaller, and the other external and greater; they receive the *Apophyses Coronoides* of the *Cubitus*, and the Pully is received into the *Cavitas Sigmatoides* of the same *Cubitus*.

The Lower-part of the *Humerus*.

The Elbow. The Elbow consists of two Bones, by reason of the different contrary motions that it has, and which could not have been performed by one Bone only, joined

joined by *Ginglymus*, which indeed would have allowed the Arm to bend, and to extend, but not to have turned both inwards and outwards, the which motions are made by the *Radius*, which to this end is joined by *Arthrodia*.

Its two Bones pretty equal to one another.

These two Bones are not so long nor so big as that of the *Humerus*, but they are both of them much of the same magnitude; nevertheless, the *Cubitus* is a very little larger than the other; and this difference has caused them to be called by some the Great, and the Little *Focile*: They are removed from one another in their middle, for the more convenient situation of their Muscles for the passage of the Vessels, and especially for their easier motion; and besides, it was fit that having different Actions, their bodies should have different Situation. They do touch one another at their Extremities, being likewise articulated together, as I shall shew you presently. One is call'd the *Cubitus*, and the other the *Radius*.

G The *Cubitus*.

The *Cubitus*, or the Bone of the Elbow, is so called, because it is this that makes the Elbow. Others have named it the *Ulna*, because in old times it served for an Ell, or a Measure; and though this Measure is not exact, some having it longer and some shorter; nevertheless, we do see some, even now-a-days, use the length of their Arm to measure things. In this Bone we must consider two things, its Articulations, and its Parts.

Articulations of the *Cubitus*.

The *Cubitus* is articulated at both ends, at its upper end two ways, with the lower end of the *Humerus* by *Ginglymus*, and with the upper part of the *Radius* by *Arthrodia*; and its lower end is joined two ways, with the *Os Carpi* by its end, and with the lower part of the *Radius* by its lateral or side-part. These two Articulations are made by *Arthrodia*.

Its Division.

We cannot well examine the Parts of the *Cubitus*, unless we do divide it into three, its Superior, Middle, and Inferior part.

H The Upper end of the *Cubitus*.

At the Superior part of the *Cubitus* we observe two Processes, and two Cavities; the smallest of these Processes is situated before, and has no particular name, but only that of *Coronè*, which is the general name to all such Prominences: The other is situated behind; it is larger than the former, and called *Olecranum*; it is on this Process that the *Carpus* is supported; it makes an acute

acute Angle when the Arm is bent, and it hinders it from bending backwards. Theſe two Proceſſes do enter into the two Cavities that are at the lower end of the *Humerus*. Of the two Cavities that are at the ſuperior part of the *Cubitus*, one which is very great is placed between the two Proceſſes, and it is called *Sinus Sigmatoides*, becauſe it reſembles a Greek *Sigma*; this does receive the end of the *Humerus*. In the middle of this Cavity there is a Line, or an Eminence, that goes from one Proceſs to t'other, and which enters into the *Sinus* of that part which is at the lower end of the *Humerus*: The other Cavity is very ſmall, it is on the lateral and internal part of the *Cubitus*; it is this which, by receiving the *Radius*, does join them together.

I The Middle part of the *Cubitus*. At the Middle part of the *Cubitus* are obſerved three Angles, of which the Internal, call'd the *Spine*, is very ſharp; the other two are not ſo keen; the one is anterior, and the other poſterior.

K The Lower end of the *Cubitus*. At the Inferior part there are two Prominences and a Cavity: The firſt of theſe Prominencies is ſituated at the lateral and inferior part, it is received into the Glenoide Cavity of the *Radius*: The ſecond is at the end of this Bone, and called *Styloides*; it ſerves to fortifie the Joint, and is therefore placed externally: The Cavity which is at the end of the Bone helps to make an *Arthrodia* with the *Carpus*.

L The *Radius*. The ſecond Bone of the Elbow is called the *Radius*, becauſe ſome will have it to reſemble the *Radius*, or Spoke of a Wheel. We are to conſider two things in it, as in other Bones, its Connexions, and its Parts.

Articulations of the *Radius*. This Bone is Articulated like the *Cubitus*, in its Superior and its Inferior part; by its ſuperior part two ways, and both by *Arthrodia*, the one with the external *Condylus* of the *Humerus*, and the other with the *Cubitus*; by its inferior part it is alſo articulated two ways, either with the *Os Carpi*, or with the *Cubitus*, and both theſe are *Arthrodia*: for the *Cubitus* and the *Radius* are joined together both above and below, only with this difference, that the upper part of the *Cubitus* receives the *Radius*, and the lower part of the *Radius* receives the *Cubitus*.

Its Diviſion. But if we would be inſtructed in all that concerns the *Radius*, we muſt likewiſe divide it into three parts, the Superior, the Middle, and the Inferior.

Three

Three things are obſerved in its Superior part, a Head, a Neck, and a Tuberoſity; the Head is round and ſmooth, for its better motion; there is over this Head a Glenoide Cavity that receives the Superior *Condylus* of the *Humerus*; the Neck is very long, for oblique motions; the Tuberoſity or Eminence is ſituated under the Neck; it is in this place that the *Muſculus Profundus* is inſerted, and one of the *Flexores* of the Thumb. M The Superior part of the *Radius*.

At the Middle part we muſt obſerve, that it has an acute Angle, called the *Spine*, and that it grows ſtill bigger as it comes nearer to the Wriſt; contrary to the *Cubitus*, which leſſens according as it is elongated from the Elbow. And in this we ought to admire the Wiſdom of Nature, which in making theſe two Bones unequal in their Extremities, found means to render the Arm equally ſtrong in its whole length, by placing the ſtrongeſt part of one Bone with the weakeſt part of the other. N The Middle of the *Radius*.

At the Inferior part are obſerved many Sinuoſities and Inequalities, which are like ſo many little Channels, made to avoid hurting the Tendons that go particularly to the outward part of the Hand. There are likewiſe two Cavities, of which one, that is at its extremity, does receive the Bones of the *Carpus*; and the other being ſmaller, is at its lateral and internal part, in the which is placed a Prominence of the *Cubitus*. We muſt not forget this Prominence, which is at the external part of its Extremity, which with the *Apophyſis Styloides* does jointly form a great Cavity, which receives the Bones of the *Carpus*, and hinders their Luxation. O The Inferior part of the *Radius*.

The Hand, properly ſpeaking, is made up of the *Carpus* or Wriſt, the *Metacarpus*, and the Fingers; it begins where the Bones of the Elbow do end, and it terminates with the ends of the Fingers. The Hand.

The *Carpus*, or Wriſt, is the firſt part of the Hand; it is a heap of Bones ſituated between the Inferior Articulation of the Elbow and the *Metacarpus*. Theſe Bones are eight, placed in two rows, four in each row. We muſt firſt examine the Situation of thoſe of the Firſt Rank, and then thoſe of the Second. P The *Carpus*. Q The Bones of the *Carpus* ſeparated from one another.

The Firſt Rank is compoſed of four Bones, of which the two greateſt are received into the Cavity of the *Radius*, by their upper part, for the motion of the Hand, The Firſt Row.

Hand, and by their lower part they do touch the three first Bones of the second Rank; the third, next to these in Bigness, is situated in the Cavity at the end of the *Cubitus*, joining to his *Apophysis Styloides*, and in its lower part is united with the fourth Bone of the Second Rank; the fourth Bone of the first Rank, which is the smallest of them all, is situated upon the third on the inside of the Hand, making a Prominence that is like unto the crooked Process of the fourth Bone of the second Rank.

The second Row.

The first Bone of the second Row is placed more within the Hand than without, which makes it the better to support the Thumb, and to answer to the crooked Process of the fourth Bone of the same Rank; the second and the third do support the first and second Bones of the *Metacarpus*, and the fourth and last Bone of the *Carpus* does support the third and fourth Bones of the *Metacarpus* by its two small Glenoide Cavities.

We must observe, that there is at the Internal part of all these Bones a crooked Process which makes a Prominence on one side, and that on the other the first Bone of the second Row does advance on the inside of the Hand, and thus the Space that is between both, being made like a Gutter or Channel, serves for a Passage to the Tendons of the *Musculi Flexores* of the Hand, which do pass by this Vacuity in all manner of safety, with the help of the Annular Ligament that covers them, and joins together all these Bones I have now spoken of.

The Figure of the *Carpus*.

The Figure of the Bones of the *Carpus* joined together is round, and raised on the outside, but it is unequal and hollow on the inside for the facility of motion.

Articulations of the *Carpus*.

There are three sorts of Articulations in the Bones of the *Carpus*, the first with the Bones of the Elbow by *Arthrodia*, as I have already said; the second with the Bones of the *Metacarpus* by *Amphiarthrosis*; and the third by *Syneurosis* between themselves, that is to say, by very strong Ligaments, which unite them together. Of these three Articulations, it is only the first that has a manifest motion; for the two others have none at all, or at least it is very obscure.

R

The *Metacarpus*.

The *Metacarpus* is the second part of the Hand, it makes its Palm by its internal part, and its back by its external; it is composed of four long, slender, and unequal Bones; they have each of them a Cavity that contains a Marrow. There are some who reckon them

them five, and to this effect they add to these the first Bone of the Thumb; but this ought not to be placed in the Number of the Bones of the *Metacarpus*, because it has a manifest Motion, when the others have it but very obscure.

Articulations of the *Metacarpus*.

These four Bones are joined with the *Carpus*, by a strong Connexion, by means of many Cartilaginous Ligaments, which allows them to have but an obscure Motion; and with the Fingers by *Arthrodia*, each of them having a round head at their End, which enters into the Glenoide Cavity that is at the End of the first Bone of the Fingers. And besides these two Articulations, which are made of their Extremities, they do mutually touch, and are united together by their lateral part, very near the place where they are joined to the *Carpus*, and this for their greater strength. They afterwards separate towards the middle, in order to leave a convenient space to the *Musculi Interossei*.

They are of a round Figure in their middle part, which is a little Convex outwardly for Strength's sake, and a little hollow inwardly for the better Apprehension, or taking things up. Their Superior Extremity is their largest part, being that which unites them with the *Carpus*; and their lower Extremity is smaller, which ends with a head that joins them with the Fingers.

Its Bones differ in Bigness.

These four Bones are not equally large, that which supports the *Index* Finger is larger than the others; the second is less than that, the third still less, and lastly the fourth is the smallest of all. I have told you that these Bones have no Motion, or at least that they had but very litle, since only the last, which is the Supporter of the Little Finger, has a little more than the rest, which is easily perceived, when two Fingers are made to spread at a distance.

S

The Fingers.

It now remains to shew you the Fingers, which are many, to the end that the Action of the Hand, which is Apprehension, might be the better performed, and that the smallest things might be taken up with them; they are five, and differ from one another both in Bigness and Length; the first is called the Thumb, being bigger and stronger than the others, and being the only one that is opposite to the rest in the matter of Apprehension; the second is called the *Index*, because we do make use of it when we would shew, or point at some-

T

The Thumb

V

The *Index*

X The Middle-Finger. Y The Ring-Finger. Z The Little-Finger.

something; the third is called the Middle-Finger, by reason of its Situation, this is the longest of them all; the fourth is called the Annular, or Ring-Finger, because the Ring is worn upon this; the fifth is the least of all, and called the Auricular, or Ear-Finger, because being little and pointed some do commonly use it to cleanse their Ears of *Sordes*.

Fifteen Bones in the Fingers.

The Bones of the Fingers are fifteen, three on each Finger; they are placed in three Ranks, called *Phalanxes*, because they resemble Ranks in Battel-array: the first Rank is of larger Bones than the second, and the second than the third, which is the smallest of them, and whose extremity does end in a Semicircle, or Crescent.

The Figure of these Bones is hollow on the inside, for the convenience of Flexion; convex on the outside for Strength sake; and a little flatned on the inside, that they might not hurt the Tendons of the *Flexores*, and for the better bending the Fist.

Articulations of the Bones of the Fingers.

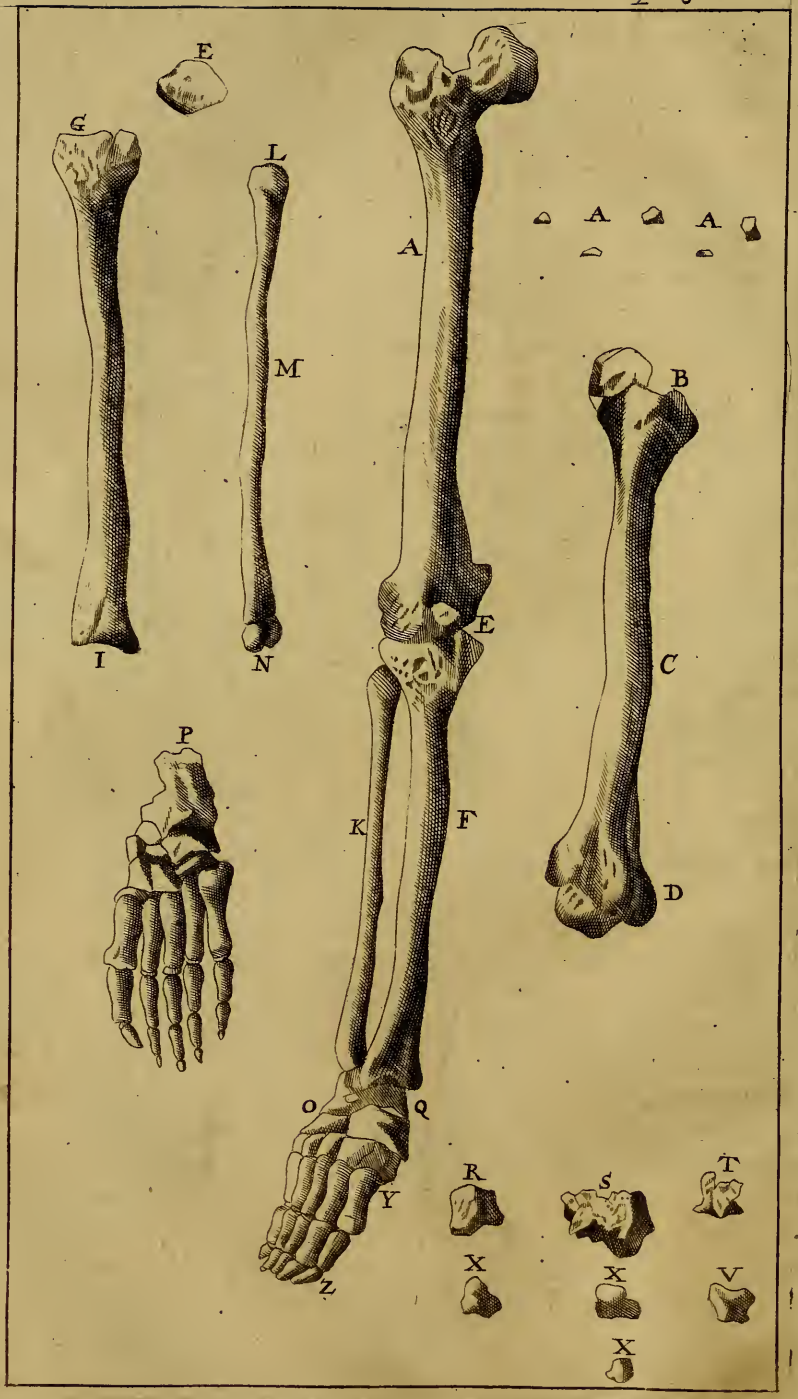
They are joined together by *Ginglymus*, having all of them both little heads and little Cavities, which do reciprocally receive one another; their Articulation with the *Metacarpus* is made by *Arthrodia*; each Finger hath likewise Ligaments, the whole Length, on the inside. These Ligaments tie these Bones mutually together.

I shall not speak to you of the *Ossa Sesamoidea*, which are found in the Junctures of the Bones of the Fingers, until I come to explain those of the Feet.

Observation on the Motions of the Fingers.

I conclude GENTLEMEN, with remarking to you, that after the manner that the Bones of the Fingers are articulated together, they are only capable of Flexion and Extension; and that if they do also ply on this side, and that side, which are called Adduction and Abduction, this does depend on the Articulation of their first *Phalanxes* with the *Metacarpus*, unto which they are joined in that place by *Arthrodia*, as I have often said.

Of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Of the BONES *of the* FEET.

The Eighth and Laſt DEMONSTRATION.

AFTER having explained to you at large the Bones of the Hand, it is fit GENTLEMEN, that I ſhould finiſh my Oſteological Demonſtrations, with the Bones which compoſe the lower Limbs; and I am perſuaded that you will not be leſs ſurprized at the Excellency of their Structure, than you have already been at that of other Parts. Theſe being the Organs of Gradation, do enable a Man to go eaſily from one place to another; and theſe do principally contribute to a Man's having that erect Figure, which gives him a Majeſtick Aſpect, which no other Animals have beſides. Of the Lower Limbs.

By the Leg is underſtood all that which is comprehended from the *Os Ilium* unto the ends of the Toes, and we will divide it as we did the Arm, into three parts, the Thigh, the Leg, and the Foot, properly ſpeaking. Diviſion of the Leg.

The *Femur*, or Thigh is made like the *Humerus* of one Bone only, which is the greateſt and ſtrongeſt of all the Bones of a Humane Body, becauſe it does alone bear the Burthen or Weight of the whole. A The *Femur*.

This Bone has Articulations ſuitable to its Magnitude and Bigneſs, having two ſtrong ones at both ends of it; the firſt is the Superior, called *Enarthroſis*, it is made by the means of a very large Head, which is received into a great Cavity; the Head is at the end of the *Femur*, and the Cavity is at the lateral part of the *Os Ilium*; this Cavity has a Cartilaginous Brim, for the better incloſing this Head, and to hinder it from luxating out of its place. There is beſides a ſtrong Ligament that ties this Head to the bottom of the Cavity, but notwithſtanding all the Precautions that Nature has taken to fortify this Articulation, it cannot but luxate ſometimes. The ſecond Connexion is made at Articulations of the *Femur*.

its lower end by *Ginglymus*, having two Heads which are received into two Cavities, that are at the Superior and Extreme part of the Tibia. Between these two Heads there is a Cavity which receives a Prominence of the same *Tibia*; and which makes the *Ginglymus*.

Its three Parts. The Parts of the *Femur* are three, to wit, a Superior, a Middle, and an Inferior part.

B The Upper part of the *Femur*. In the Superior, we must examine, a Head, a Neck, and two Processes; the Head is large and round, it is formed of that Procès which is inserted into the *Cotyla* of the Hips, the little Pit that is in its middle is the place where the Ligament rises that ties it unto the *Os Ilium*, This Part deserves better the Name of a Head, than any other in all the Body, nay it has more of that Figure than other parts have, being larger than the Neck which supports it, although this be very large too, and very long; it inclines outwardly, not only for the convenient Situation of the parts of the Thigh, but for the stronger going. This Neck is oblique, because the Cavity of the *Ischium* not being situated in a straight Line, the Head of the *Femur* would not otherwise have been able to enter well into it; Moreover, the Neck stretching thus outwardly, it separates these two Bones from one another, and causes the rest of the Bones to descend in a straight Line, and the Body to be more conveniently and surely supported.

The two Processes which are behind the Neck of the *Femur*, are called *Trochanters*, from a Greek Word signifying to turn, because the Muscles which do make the motions of the Thigh, and particularly those which cause it to turn are inserted in these Processes, of which the Superior and the greatest is called, the great *Trochanter*; it gives Insertion to the *Musculi Extensores* of the Thigh; and for this reason its External part is rough and unequal, that they may insert the better; and at its internal part, which regards the Neck, there is a Cavity, over which there is found a kind of *Sinus*. The second Procès is smaller, and placed underneath, and is called the lesser *Trochanter*.

C The Middle of the *Femur*. We must observe, that there is on the inside of the *Femur* a straight Line which serves for the Insertion of Muscles. We must also observe, that the middle part of

of the *Femur* is round, that it is ſmooth and equal in its anterior part, and unequal in its poſterior part, where a Line is found to be drawn all the Length of the Bone, as I have already ſaid before. This Bone has a great Cavity its whole Length, which contains Marrow, as the reſt do, and this makes it be the lighter. It is convex outwardly, and a little crook'd or concave on the inſide, inſomuch that it ſerves for a Buttreſs to our Body, to hinder it from falling, and from inclining too much forwards. And this Surgeons ought to mind in the Fractures that happen to it, they muſt take care not to compell it to receive a ſtraight poſition, ſince it has not ſuch a one in its natural State.

At the Inferior part of the *Femur*, there are two Proceſſes, called *Condyli*, and theſe do make the *Ginglymus* that I ſpoke of. They are covered with a large Cartilage, as are all the other Extremities of Bones. There is between theſe two *Condyli* a Cavity which receives the Prominence of the *Tibia*. Likewiſe at the upper part of the *Femur*, there is a Vacuity which gives a Paſſage to the Veſſels that go down to the Leg. This Vacuity is inveſted, like all other Cavities, as well as the Proceſſes which do ſerve for the Connexion of Bones; they are plaiſtered over with a Cartilage which is ſmooth and ſlippery, in the maſs of which there are ſmall Glands which have each of them a ſecretory *Ductus*, through which runs that ſlimy Liquor, which ſerves to facilitate the motion of the Joint. When this ſame Slime comes to thicken by reaſon of its abundance, it glues the Heads of the Bones together with their Cavities, and this Union is called *Anchyloſis*, which is a diſtemper of the Bones very hard to cure in old Luxations.

D The lower part of the *Femur*.

That Part which is at the lower end of the Thigh, and the upper end of the Leg, is called the Knee, where there is found a particular Bone called the *Rotula*, becauſe it is like a little Wheel; others call it the Knee-pan. It is a round and large Bone that lies at the Articulation of the *Femur* with the *Tibia*. Its Subſtance in Infants is cartilaginous for ſome Months, afterwards it comes to be Bony: its Figure is like the circular Boſs of a Buckler, its Middle part being thicker and more prominent than its Brims.

E E The *Rotula*.

Articulations of the *Rotula*.

The *Rotula* is moveable, and is articulated by a kind of *Ginglymus*; it is covered with the *Aponeuroſes* of four Muſcles that are *Extenſores* of the Leg, which are inſerted at its External part, and its Brims. It is inveſted at its Internal part with a ſlippery Cartilage, to facilitate the motion it is obliged to make on the Extremities of the *Femur* and the *Tibia*.

Uſes of the *Rotula*

It does ſerve not to fortify the Articulation of the Thigh-Bone with that of the Leg, nor to hinder the too great Flexion forwards, but to give more Strength to the *Extenſor* Muſcles of the Leg, to which it is a Support, and ſerves for a Pully for the Tendons of thoſe ſame Muſcles to ſlide along upon its Cartilage. The Fracture of this Bone is very hard to cure, and often leaves Men remaining lame.

Two Bones in the Leg.

The Leg is the ſecond part of the Lower Limb; it comprehends from the Knee down to the Foot; it conſiſts of two Bones, of which one is very big, called the *Tibia*, and the other ſmaller called the *Fibula*.

What they have common to both of them.

Theſe two Bones do only differ in Bigneſs, being of the ſame Length; for if the *Tibia* riſes higher, the *Fibula* deſcends the lower; they have both of them a triangular Figure, but that of the *Fibula* is more irregular; they are jointed together at their ends, but ſeparate aſunder in their middle to give room to the Muſcles, and to give a paſſage to the Veſſels. They have both of them the Name of *Focile*, with this difference that the *Tibia* is called the greater *Focile*, and the *Fibula* the leſſer *Focile*. They do alſo each of them make a *Malleolus*, or Ankle-bone. And theſe two Prominences are on the ſides of the Foot, the *Tibia* making the inward Ankle, and the *Fibula* the outward.

F

The *Tibia*.

The *Tibia* is the largeſt Bone of the Leg, hollow within its whole Length for containing the Marrow; it is ſituated on the inſide of the Leg: we ſhall conſider two things in it, its Articulations, and its Parts.

Articulations of the *Tibia*.

It is articulated at both its ends by *Ginglymus*, that above is made with the *Femur*, that below is made with one of the Bones of the *Tarſus*, called *Aſtragalus*. It is likewiſe joined with the *Fibula* by *Arthrodia*, at both its ends, but laterally. The *Fibula* has a ſmall Cavity in its ſuperior part, that receives the *Tibia*, and below it has a ſmall Prominence that is received into the *Tibia*.

This

This laſt Bone has three parts, a Superior, a Middle, and an Inferior part.

The Superior Part is the biggeſt of all the Bones, it has in its Middle a Proceſs, that is received into the Cavity which is at the end of the *Femur*. There are on both ſides of this Proceſs two ſmall Cavities which do receive the heads of the *Femur*. Their depth is encreaſed by a *Cartilago Lunata*, which is not deprived of motion, although it be faſtened by Ligaments; it is ſoft, ſlippery, and beſmeared with an unctuous Humour; it is thick in the brim, and ſlender towards the centre, which has occaſion'd its name of *Lunata*. G The upper part of the *Tibia*.

The Middle part of the *Tibia* is almoſt Triangular, having three Angles, of which the moſt remarkable is the Shin, being long and ſharp before, like the edge of a Knife; whence it comes to paſs that blows received upon this part are very much felt, by reaſon that the Skin and the *Perioſteum*, which cover it, are often cut with the blow: According as this Bone approaches to the Foot, it leſſens in bigneſs; but in recompenſe of that, it grows the harder as it deſcends. H The Middle of the *Tibia*.

The Inferior part of the *Tibia* does terminate in two little Cavities, which receive the Prominences of the *Aſtragalus*; and from the middle of theſe Cavities there riſes a ſmall Protuberance, which is received into the Cavity that is found at the upper part of the *Aſtragalus*; and from the ſide of this Cavity there is a pretty large Prominence which forms the Internal Ankle, which hinders the Luxation of the Foot, by keeping it firm and ſtrong. I The Lower part of the *Tibia*.

The *Fibula* is the leaſt of the Bones of the Leg; nevertheleſs, it often happens in Fractures of the Leg, that the *Tibia* ſhall be broke, and this will remain whole; becauſe being ſlender, it will ply the more; and by reaſon of this plying a little, it will not break ſo eaſily as the other. It is ſituated at the external part of the Leg. K The *Fibula*.

This Bone is articulated at both its ends with the *Tibia* by a kind of more compact *Arthrodia*, the which is fortified by a Ligament both above and below it. Articulation of the *Fibula*.

This Bone has three parts, a Superior, and Middle, and an Inferior part.

L The Upper part of the *Fibula.* The Superior is a round head which does not touch the Knee, ending a little under it, at the place where it is articulated with the *Tibia.*

M The Middle. The Middle part is ſlender and long, and of a triangular figure, like the *Tibia*, but a little more irregular.

N The Lower part of the *Fibula.* The Lower part hath a *Condylus* which makes a Proceſs, call'd the Outward Ankle; it is a little hollow within, that it may leave a liberty to the *Aſtragalus* to move freely. It is remarkable, That the lower end of this Bone deſcends a little lower than that of the *Tibia.*

O The Foot. All that is comprehended from the Inferior Articulation of the Leg, unto the end of the Toes, is called the Foot, in propriety of ſpeech. It is compoſed of the *Tarſus*, the *Metatarſus*, and the Toes.

P The Bottom of the Foot. The Foot is of an Oblong figure, for the better performance of its function, and to keep it the ſtronger. It is longer than big, to the end a Man may not fall upon his Noſe in walking, and that he might not be obliged to throw his Legs too far aſunder.

Its Superior and External part is Convex, in order to help to form the Cavity which is found in its Inferior and Internal part, call'd the Sole of the Foot: This Cavity has its Uſes; for beſides that it contributes to the convenience of Walking, and to the Standing firm, it alſo leaves a free paſſage to the Tendons that go to the Toes, and it lodges one of their *Flexores.*

Q The *Tarſus.* The *Tarſus*, which is the firſt and largeſt part of the Foot, is a collection of ſeven Bones, of which four have diſtinct Names, and the three others only that of *Cuneiformia.*

R The *Aſtragalus.* The Firſt is the *Aſtragalus*, which ſerves for a *baſis* to the Bones of the Leg, under which it is articulated. We conſider in it ſix ſeveral Surfaces: The firſt, which is the ſuperior, is ſmooth, and made like a Pully, upon which the great Bone of the Leg is placed. This part has the figure of the Nut of a Bow, uſed in old times, which has cauſed it to be called the Bone of the Croſs-bow: The ſecond Surface, which is Anterior, is a large Head that enters into the Cavity of the *Os Naviculare*, with the which the *Aſtragalus* is ſtrongly articulated: The third, which is the Poſterior, is ſtrongly

ſtrongly united with the *Calcaneum*, whoſe Head it receives: The fourth, which is the Inferior, is rugged and unequal; it riſes in ſome places, and ſinks in others: The fifth and ſixth Surfaces of the *Aſtragalus* are the two lateral, which are incloſed by the two *Malleoli*, or Ankles.

There is found in theſe parts an unctuous Humour, which moiſtens not only this Joint, which is in a continual motion, but alſo the Tendons of the Muſcles that go to the Foot, and which do paſs under the *Malleoli*.

S The Second Bone of the *Tarſus* is the *Calcaneum*, or the Heel-bone; it is the greateſt, the thickeſt, and the moſt porous of all the Bones of the *Tarſus*; it is this Bone only which hinders the Body from falling backwards, being ſituated at the poſterior part of the Foot, and the other at the anterior: Wherefore it is called by ſome the *Spur-bone*; and in this the Tendon of *Achilles*, which is the biggeſt and ſtrongeſt of all the Tendons, is inſerted, conſiſting of the *Muſculus Plantaris*, and the two *Gemelli*, or *Gaſterocnemij*, which are the three chief Muſcles that form the Calf of the Leg; this Bone is doubly joined with the *Aſtragalus*, although it be alſo with a flat head joined with the *Os Cuboides*. It is obſerved, that there is in its hinder part an Appendix, which in time does come to unite with it. And laſtly, This poſterior Prominence does hinder the Body from bending too much backwards.

The Calcaneum.

T The Third is the *Os Scaphoides*, or *Naviculare*, ſo called, becauſe it reſembles a little Boat; it has a pretty large Cavity, that goes from one of its ends unto the other, in which the large head of the *Aſtragalus* is received, which joins them both ſtrongly together; and on the other ſide of this Cavity it has three Protuberances, to which the three laſt Bones of the *Tarſus* are articulated.

Os Scaphoides.

V The Fourth is the *Os Cuboides*, ſo named by ſome, becauſe being of a Square figure, it is like unto a Cube; and by others it is called Multiformous; it is greater than the three which remain to be ſhewn; it is ſituated before the *Calcaneum*, unto which it is joined by an unequal Surface; it is likewiſe articulated with the ſeventh Bone of the *Tarſus*, and if we examine this alone, we ſhall find it have ſix ſides like a Dye.

Os Cuboides.

XXX *Ossa Cuneiformia.* The Fifth, Sixth and Seventh Bones of the *Tarsus* are called *Cuneiformia*, because they have the figure of a Wedge that cleaves Wood. Although they are like to one another in figure, nevertheless they do differ in magnitude; one of them is greater than the rest, another of a middle size, and the other is the least of all; they are all three articulated with the *Os Scaphoides* by one of their ends, and by the other end they do one of them support one of the Bones of the *Metatarsus*, the two others being supported by the *Os Cuboides*.

Y The *Metatarsus.* The *Metatarsus*, or Instep, consists of five Bones situated sideways to one another, for the sustaining each of them a Toe; these Bones are very compactly join'd together at that end where they are united with the *Tarsus*, for the stronger Articulation; but they separate from one another in their middle, for the insertion of the *Musculi Interossei*; they are Convex outwardly, and hollow within, for the more easie reception of the Tendons of the Muscles; they are long and slender, and end with a little head, which entring into the Cavity that is at the end of the Bones of the first *Phalanx* of the Toes, does unite them together by *Arthrodia*. That which supports the Great Toe is the largest, the strongest, and the shortest of the five; the second is not quite so big; the third is still less; insomuch that they still lessen, so that that of the Little Toe is the least of them all; they have at their slendrest end a Head cover'd over with a little Cartilage, for the freer motion of the Toes.

Its Figure.

Z The Bones of the Toes. In the Bones of the Toes we consider the same things as we did in those of the Hand, excepting their number, which is but fourteen in the Foot, whereas they were fifteen in the Hand, by reason that the Great Toe has but two Bones, and the Thumb has three.

The reason of it is this: The first Bone of the Great Toe is numbred with those of the *Metatarsus*, as having no more motion than the four others; which Account causes the *Metatarsus* to consist of five Bones, whereas the *Metacarpus* has but four; because the motion of the first Bone of the Thumb is made upon one of the Bones of the *Carpus*, as I shewed you before.

Fourteen Bones in the Toes, and their Articulations. Of the fourteen Bones of the Toes, there are two to the Great Toe, and three for each of the four other Toes;

Toes: They are distributed into three *Phalanxes*, or Ranks, as those of the Fingers; those of the first Order, or Rank, are greater than those of the second; and those of the third are less than the others, and so of the rest. They are of the same figure as those of the Hand; for they are Convex outwardly, and Concave within; they have likewise the same Connexions, to wit, by *Arthrodia* with the Bones of the *Metatarsus*, and by *Ginglymus* with one another.

There are found in the Joints of the Bones of the Hands and Feet some very small Bones, called *Ossa Sesamoidea*, by reason of the resemblance they have with the Seed of *Sesamum*; they do adhere to the Tendons, under which they lie hid, and are covered with Ligaments, insomuch that they never fail to be gone, when the Bones are cleaned in order to make a Skeleton, unless very great care be taken to preserve them. A A *Ossa Sesamoidea.*

Their figure is round, like a small Pea, being yet a little flatned, and even hollow on the side where they touch the other Bones, and remaining round on their external side. Those of the Hand are greater than those of the Foot, excepting only those that belong to the Great Toe, which are the greatest of them all: Nevertheless, those of the Hand are not all of the same bigness, for those of the Great Fingers are greater than those of the Little Finger; also those that are at the Joints of the Bones of the first *Phalanx* are bigger than those of the second, and the third. Their figure.

Their Number is uncertain, although we do commonly count twelve of them in each Hand, and the same in each Foot; yet there are sometimes more of them, and sometimes fewer. In Old People there are more of them found than in Younger Persons, because they do begin by small Cartilages, which come to grow Boney with time. Their Number.

These Bones, as small as they are, yet are not useless; for they not only serve to strengthen the Joints, and to hinder Luxation, but their principal Use is to serve for Pulleys to the Tendons of the Muscles, which go to the Fingers, in order to retain them in their due places, and to hinder them from falling upon the Joint, there being to that end some *Ossa Sesamoidea* on the right, and on the left of the Tendons. Their Use.

Thus,

The certain Number of all the Bones 235, without reckoning the *Ossa Sesamoidea*, and the *Os Hyoides*.

Thus, GENTLEMEN, you have seen all the Bones that use to be shewn in a Humane Body. There have been some who have farther added some little Bones which are found now in the Hand, then in the Foot, and sometimes in the Ham. But because those are seldom found at all, unless rarely, they do not deserve to be inserted in the number of Two hundred thirty five, which do compose a Skeleton.

I shall continue hereafter the same Order in the rest of my *Anatomical Demonstrations*, as I have done in those of the Bones; and suiting my Discourses to the New Discoveries, I shall endeavour to shew you a Humane Body according to our knowledge of it at present.

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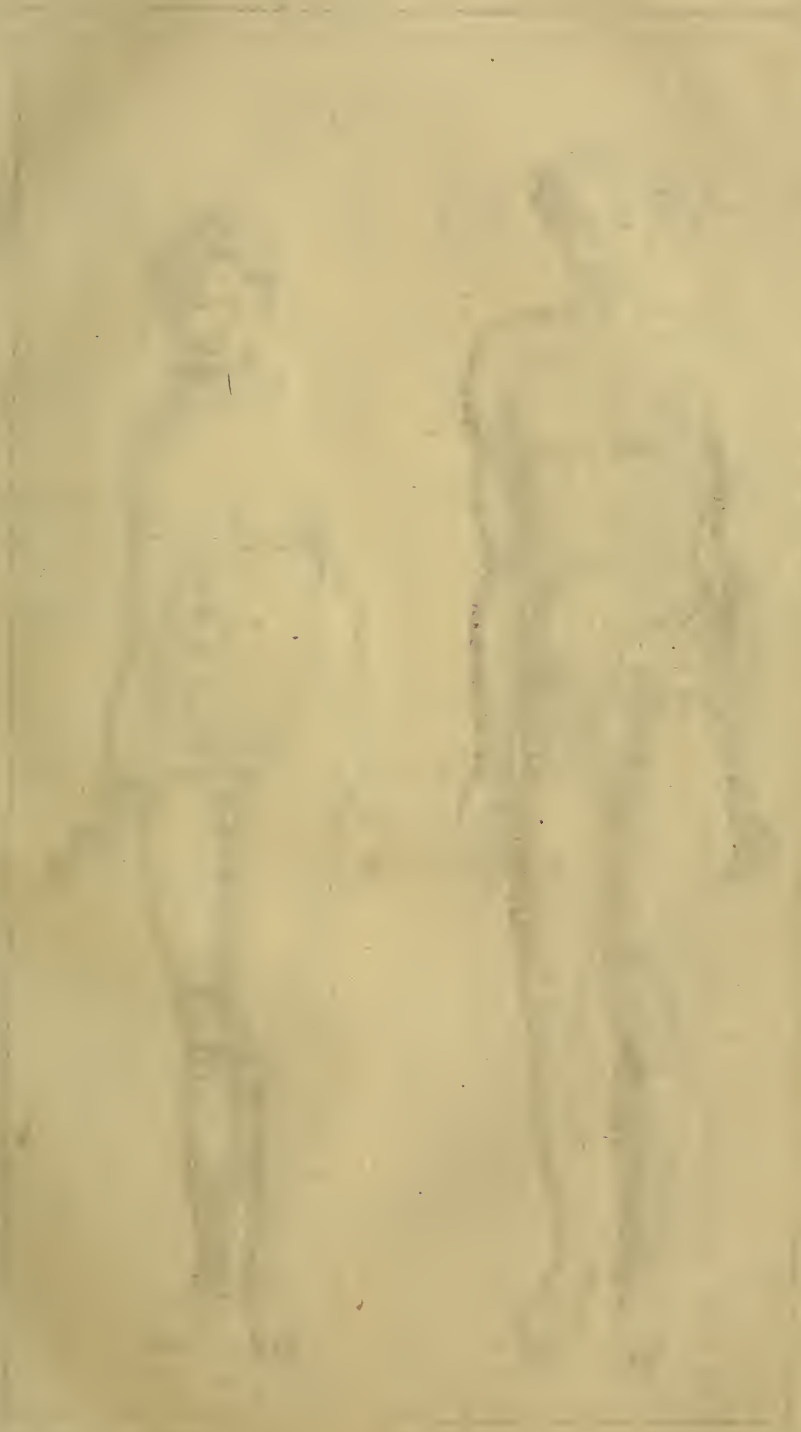

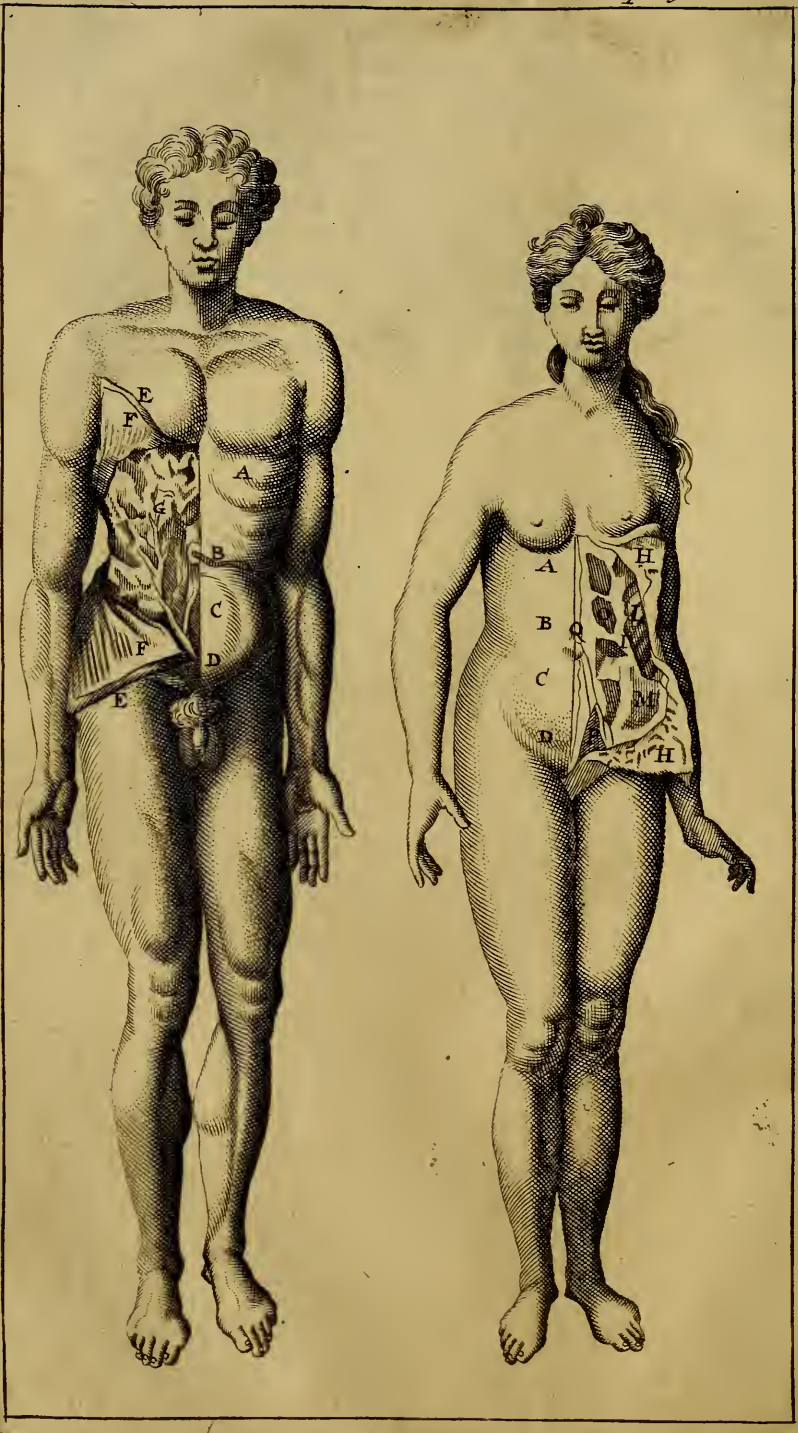
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THE ANATOMY OF A HUMANE BODY,

According to the Doctrine of the CIRCULATION, and the late Discoveries.

The FIRST DEMONSTRATION.

Of the Parts Containing.

I Do not intend, GENTLEMEN, in these *Demonstrations*, to make an *Elogium* upon MAN, nor to expatiate upon the Advantages which He hath over the rest of Animals; because such things would make too great a Digression. Therefore, without stopping to observe what it is that raises him above all the Beings that we see in the Universe; I will presently begin with telling you, that the Science which leads us to the knowledge of Man's Structure is called *Anthropology*. *Anthropology.*

This Science contains two Parts: The first treats of the Soul, and is called *Pscology*, of which I shall say nothing: And the second makes us to know the Body, and all that depends upon it, and this is call'd *Anatomy*.

Definition of *Anatomy.*

It is Defined an Artificial Diſſection of a Body, in order to know the Parts which compoſe it. It is chiefly divided into two parts, *Oſteology*, and *Sarcology*: The firſt treats of the Bones and Cartilages; and this of the Fleſh, and other ſoft and tender Parts.

Having already explained all that relates unto Bones, in the Eight preceding *Demonſtrations*; it remains for me to ſhew before you the ſoft Parts: But that I may do it in Order, let us divide *Sarcology* into three parts, into *Splanchnology*, into *Myology*, and into *Angeiology*. The firſt gives an Account of all the Internal Parts, and eſpecially the *Viſcera*; the ſecond inſtructs us in the Muſcles; and the third, in the *Vaſa*, or Veſſels, ſuch as the Nerves, the Arteries, Veins, and Lymphatick Veſſels. On theſe three parts I hope to entertain you diſtinctly, and ſhall endeavour to make you underſtand them throughly, in the Courſe of my following *Demonſtrations*.

Anatomy abſolutely neceſſary to Phyſicians and Surgeons.

The Science of *Anatomy* is ſo uſeful and ſo advantageous to all Men, and eſpecially to thoſe who practiſe Phyſick and Surgery, that theſe cannot neglect the knowledge of it, without abandoning wholly their Profeſſion, it being the *baſis* and foundation of it; and it being impoſſible for them to cure Diſtempers, or to perform any Operation, unleſs they do know before-hand the Part affected: For to how great Dangers would wounded Men be expoſed, if the Surgeon, who is to make an Inciſion, or to uſe the Trepan, or to extract Bullets, or a Splinter of a Granado, did not know how theſe Parts are formed? Could he, without this Knowledge, cure ſo many wounded Men, and perform ſo many fine Cures in the Army, where ſtrange and amazing Wounds do happen every day?

Anatomical Lectures reſtored at the *King's Garden.*

And it is for this Reaſon, GENTLEMEN, that the King, who well knows how uſeful able Surgeons are, has pleas'd to Order theſe Exerciſes in the *Royal Garden* to be again renewed, they having ſuffered an Interruption for divers Years; to the end that Publick Anatomies ſhould here be made *gratis*, and all the Operations of Surgery ſhould here be ſhewn, for the giving a free Opportunity to Students to make themſelves perfect in an Art, unto which His Majeſty does owe the Preſervation of his greateſt Captains.

The King could not commit the care of his Orders, at the *Phyſick Garden*, better than unto him to whom he

he had committed the care of his Health, and therefore then chose Monsieur *Daquin*, his First Physician, to have the Inspection of these Matters. And these Exercises are now continued with much better success, under the Orders of the famous Monsieur *Fagon*, whom His Majesty hath expressly chosen for his First Physician, insomuch that this School may now be said to be one of the most flourishing in the World. Nay, and the choice which this Great Man has made of able Professors, both in Anatomy, and in Chirurgical Operations, as well as in Chymistry, and in the Teaching of Plants in the Garden, does sufficiently evince what a Love he hath for the Sciences, and how great a Consideration he hath for those that apply themselves to them.

It is in Obedience to his Orders, that I shall observe to you, in this Dissection, all the curious Discoveries of the Moderns, and shall confute the Errour of the Ancients, who thought the Blood did move from the middle of the Body to the extremities, without ever returning back again; and that it advanced forwards but only in proportion as some part of it got out of the Orifices of the Vessels, for nourishing the Animal; and that the Chyle was carried to the Liver, as to the Principle of Sanguification, through the Mesenterick Veins. These Opinions have been received by the Ancients without any Proof, in times when Men did make a scruple to doubt whether the former Anatomists were capable of mistaking. But now-a-days, when we do not submit blindly to Authority in such Matters, and when we enquire into the Reasons that former Authors had for establishing certain Opinions of theirs; this Doctrine does appear to be a meer Imagination, without any good foundation.

A Humane Body the Subject of Anatomy.

To return then to the Subject for which we are met together, and to give you those Lights you expect from me in this Anatomy; I do believe, GENTLEMEN, you will agree with all Anatomists, that a Humane Body is the most proper of all others that can be proposed for these kinds of Demonstration, not only because it is the Master-piece of Nature, and consequently the most perfect of all Bodies, but because it is of much more advantage to Physicians and Surgeons to know it rather than any other.

In

In a Diſſection there are two ways of knowing a Humane Body, either by the Senſes, or by the way of Reaſon: But this may be ſaid in ſome meaſure to depend on the other; wherefore we begin with the Senſible Parts, becauſe they do lead the Reaſoning Part to frame a Judgment on what is Inſenſible.

The Parts which compoſe a Humane Body.

Theſe Parts are External or Internal; and although both of them do fall under the Senſes yet there is this difference, that the firſt ſort do occur to our Eyes, as the Head, the Arms and the Legs, whereas the others are not diſcovered till after ſome Preparation.

The due Proportion of the External Parts.

In the External Parts we do obſerve only the Proportion they ought to have in reſpect to one another. For Example: The Head ought to be of a bigneſs ſuitable to the reſt of the Body, but yet rather large than little, of an oval figure, flatned on the ſides, and prominent both before and behind, becauſe it ought to be neither round nor ſharp-pointed: The Forehead ought to be large, the Features ſtrong or manly, eſpecially in Men, who ought not to value themſelves on account of Beauty. The Neck ought to be long, and not too large: The Breaſt large, capacious, and riſing like an Arch; becauſe if it were ſharp, flat, or ſunk, the Heart and the Lungs would not have liberty enough to move as they ought. The Breaſts of a Man ought to be leſs prominent than thoſe of the Female Sex: The Belly ought to be round, and to riſe a little: The Spine ought to be ſtraight; the Buttocks a little large; the Hips advanced; the thighs round and firm; the Joints large; the Legs well made, and a little large; the Foot large; the Arms fleſhy, not too long, proportionable to the Body, but eſpecially the Muſcles and the Veins ought to appear in them: And laſtly, the Hands ought to be ſtrong, for the better enduring of Labour.

Diviſion into Similar and Diſſimilar Parts.

The Parts of Man are divided into Similar and Diſſimilar Parts. The Similar are thoſe which do not conſiſt of Particles of a different nature: Of theſe we do reckon Ten in all, the Bones, the Cartilages, the Ligaments, the Membranes, the Fibres, the Nerves, the Arteries, the Veins, the Fleſh, and the Skin.

Diviſion of the Similar Parts, according to the Ancients.

It was pretended heretofore, that the Parts were Spermatick, Sanguine, or Mix'd: Thoſe Parts were called Spermatick, in which there was thought to be more of *Semen* than Blood, as in the eight firſt; and thoſe

thoſe were called Sanguineous in which Blood was thought to be predominant, as in the fleſhy Parts; and thoſe were called Mix'd, which were believed to be equally compounded of *Semen* and of Blood, ſuch as the Skin. But the Diſquiſitions of the Moderns have taught us, that all theſe Parts are Spermatick, ſeeing they are all found to have exiſtence in the Egg, as I ſhall ſhew you in the Sequel.

Diſſimilar Parts. The Diſſimilar Parts are thoſe that are compounded of Parts of a different Nature, as the Finger, which can be divided into Bone, Nerves, Arteries, *&c.*

Organical Parts. Beſides all theſe Parts, there are ſome that are called Organical, becauſe they do ſerve for Organs and Inſtruments for certain Actions, which cannot be perform'd without them; as the Foot, which ſerves for Walking, and the Hand for Writing.

Some have pretended, that there were no Organical Parts beſides the Diſſimilar; and they have often confounded them together, but improperly; ſeeing the Arteries, the Veins, the Nerves, and the Bones, which are Similar Parts, are nevertheleſs Organical, by reaſon of their functions, as well as the Foot and the Hand.

Diviſion of a Humane Body. In order to Demonſtrate well all theſe Parts one after another, we muſt, GENTLEMEN, divide the Body into the Trunk, and the Limbs. Although this Diviſion be a common one, yet it is the beſt and the cleareſt of all. The others are more extenſive, but very intricate and obſcure.

What the Trunk is. By the Trunk of the Body, we do underſtand Three Parts, or Three principal Regions, which are the Head, the Breaſt, and the *Venter* or *Abdomen*: The Head is in the higheſt poſition of all the Body, the Breaſt in the middle, and the *Abdomen* is the inferior part of the Trunk.

The Limbs. The Limbs are Four; two ſuperior, called the Arms; and two inferior, the Legs. I ſhall ſpeak of the Limits that Nature has given unto all theſe Parts, as I ſhall Demonſtrate every one of them in particular.

With what Part to begin the Diſſection. The Opinions of Anatomiſts are divided on the choice of the Part with which we ought to begin; ſome ſay we ought to begin with the Brain, becauſe it is the nobleſt Part of the Body, and it is that which commands all the reſt: Thoſe who are of a contrary opinion, do pretend that all the Parts of Men are equal,

equal, in that they were formed at the same time, and could not be one of them without the other: And thus we ought to begin with the Part that rises first to our view. The one Party follows the Order of Dignity, and the other that of Situation. We shall leave them both, to follow the Order of Necessity, according to which we shall begin with the *Abdomen*, because it incloses the Excrements, and the Parts that are most subject to Corruption; and we cannot make a perfect Dissection of the Whole, unless we begin with removing these.

Definition of the *Abdomen*. The *Abdomen* is all that Cavity which is extended from the *Diaphragma* unto the *Os Pubis*. Although the word *Venter* does include all Cavities; nevertheless, this Part does retain that Name by way of Excellence, being the greatest Cavity in all the Body. It is called the Lower *Venter*, to distinguish it from the two others superiour to it.

Its Substance. Its Substance is soft and fleshy before, and it can therefore extend and contract it self freely, both for easier Concoction, and for expulsion of Excrements, as well as to make room for the expansion of the *Matrix* during Child-bearing. It is terminated above by the *Cartilago Xiphoides* and the *Diaphragma*, by the true and the false Ribs, below and before by the *Os Pubis*, on the Sides by the Hip-bones, and behind by the *Vertebræ* of the Loins and the *Os Sacrum*.

Its Division. The *Venter* is commonly divided into an Anterior and a Posterior part: The Anterior, which is that we call the *Abdomen*, is divided into three regions, of which the superior is called the Epigastrick, that in the middle the Umbilical, and the inferior the Hypogastrick; the first begins at the *Cartilago Xiphoides*, and ends two fingers breadth above the Navil; the second begins where the former ended, and determines about two fingers breadth below the Navil; and the third descends unto the *Os Pubis*.

A A The *Epigastrium*. Each of these three Regions is divided into three Parts, a middle, and two lateral parts. The middle part of the Epigastrick region is call'd the *Epigastrium*; and the two Sides *Hypochondria*, of which one is the right, and t'other the left *Hypochondrium*.

That a Surgeon ought to know the Parts contained in the Three Regions. And seeing it is necessary that the Surgeon should know how to distinguish the different Parts which are contained in these three Regions, it may not be amiss

amiſs to deſcribe them all one after another, both in the middle and in the lateral parts of the Regions. The *Epigaſtrium* incloſes the ſmall Lobe of the Liver, and a part of the Stomach with its Inferior Orifice, and alſo the middle part of the *Colon*; the Right *Hypochondrium* contains the great Lobe of the Liver, and the Bladder of Gall; and the Left contains the greateſt part of the Stomach, and the Spleen.

BB The Navil.

The middle part of the Umbilical Region is called the Navil; its two Sides are the two Loins, one on each ſide, the Navil includes the greateſt part of the *Inteſtinum Jejunum*, and the Meſentery; the Right Loin contains the Right Kidney, the *Inteſtinum Cœcum*, and part of the *Jejunum* and *Colon*; and the Left Loin the Left Kidney, and ſome part of the *Colon*, and *Jejunum*.

CC The *Hypogaſtrium*.

The middle of the Hypogaſtrick Region is called *Hypogaſtrium*; its Sides are the *Ilia*, or the Flanks, and under it we find the *Rectum*, the Bladder, and the *Matrix* in Women; the *Ilia* are ſo called becauſe they do contain the Gut *Ilium*.

DD The *Pecten*.

The lower part of the Hypogaſtrick Region is likewiſe divided into three, the middle, or that of the *Pubis* or *Pecten*, and two lateral, called the Groins. The *Pubis* begins to be covered with Hair at fourteen years old; the Groins give paſſage to the Spermatick Veſſels, it is in theſe Parts that Tumours do too often riſe, called Buboes.

The back-part of the *Abdomen*.

The poſteriour part of the *Venter* extends from the laſt Ribs unto the end of the *Os Sacrum*; it is divided into a ſuperior part, called the Loins, and an inferior called *Nates* the Buttocks, between which there is a Fiſſure, and a *Foramen* called *Anus*, which is the Sink, or Drain of the groſſer Excrements of the Body.

Its Diviſion into Parts Containing and Contained.

The *Venter* or Belly, is that Cavity which contains and incloſes the Parts which ſerve for Nouriſhment, and for Generation. It is compoſed of two kinds of Parts, whereof the one are External, and containing, and the others internal and contained.

What are the Containing Parts.

The firſt of theſe are common or proper; the common Parts containing are the Teguments as the *Epidermis* or *Cuticula*, the *Cutis* or Skin, and the Fat. The proper containing Parts are the Muſcles of the *Abdomen*, and the *Peritonæum*.

Before we lay open the Muſcles of the *Abdomen*, it is convenient to tell you that all the Ancients, and the greateſt

What it is that was called *Panniculus Carnosus.*

greatest part of the Moderns, do reckon up and shew five Teguments: they look'd upon the *Panniculus Carnosus*, as the fourth Tegument of the Body; and it is according to them, a thick Membrane, which covers all the Body, and which also does become musculous in some places. But this *Panniculus Carnosus* ought not to be accounted a containing part of the *Abdomen*, because there is no such thing in the Body, and what is shewed usually, is nothing but the Membrane of Fat.

The Opinion of the Ancients on this matter;

The Ancients gave unto it the Use of wrinkling the Skin; but where-ever we see the Skin run into wrinkles, there are particular Muscles for it, called cutaneous, as in the Forehead the Frontal, in the *Occiput* the Occipital, in the *Scrotum* the *Dartos*. They have said, that these Muscles had particular motions, but not so all over the Body; and that they were not observed but only in places where there was no Fat between the *Panniculus Carnosus* and the Skin, which is false; for we observe no Fat between it and the Skin, as in the Forehead and the *Occiput*; in Animals too which move their Skin, there is no Fat found between the *Panniculus Carnosus*, and the Skin. Besides, in Animals this *Panniculus Carnosus* is a cutaneous Muscle, as well as the *Dartos* of which I spoke.

and their Error concerning the common Membrane of the Muscles.

The Fifth and last Tegument of the Body was also, according to the Ancients, the common Membrane of the Muscles; they called it so, because they said it contained or covered all the Muscles. But it is an Error; for every Muscle has its proper Membrane, and it is known that this pretended common Membrane is not to be found in a Humane Body, nor in Animals, unless we take for it some *Aponeurosis*, or the proper Membrane of a Muscle, as it is customary to do in the *Abdomen*.

E E

The *Epidermis.*

The *Epidermis* is a very thin Membrane and strongly fastned to the Skin, which it immediately covers, wherefore it is a Tegument as well as the others; some do call it the first Skin, others the *Cuticula*, it being as thin as the peel of an Onion, and lastly others the *Epidermis*, because it is situated immediately upon the Skin.

Its Origin according to the Ancients.

Most Authors say, that the *Epidermis* is made of an oily, unctuous, and moist Vapour, which exhales from the Skin, and the parts that are under it; and that this Vapour

Vapour hardens by the Air, which ſtrikes its Impreſſion upon our Skin continually. They likewiſe give us the compariſon of that ſmall Skin which is formed upon Ebuilition, when the Liquor is left to ſettle. But this Opinion will hardly anſwer Experience, which tells us that Infants, whilſt they remain in the Womb, and who conſequently have had no Impreſſion from the Air, have nevertheleſs an *Epidermis*. This is ſo true, that whenever a Woman miſcarries (let the *Fœtus* have more, or fewer Months) this is found in them thick enough to be diſtinguiſhed from the Skin. And it is to be ſeparated from the Skin, even in Abortions, where the *Fœtus* remained ſome time dead in the Womb. So that we have no reaſon to doubt but the *Epidermis*, as well as all the other parts, is always to be found incloſed in the Egg.

That which ought to confirm us in this Opinion is, that theſe ſame Authors do aſſign to this part the Uſe of ſhutting the Orifices of the Veſſels which determine inthe Skin, and that it hinders the waſt of Humours which would otherwiſe be at theſe Orifices; which could not be in a *Fœtus*, whilſt it is ſtill in the Womb, becauſe it would have no *Epidermis*, for want of having had the Impreſſion of the cold Air.

The *Epidermis* has the ſame Figure, and the ſame Magnitude as the Skin, becauſe it follows the ſame dimenſions, according to the Encreaſe or Diminution of the Body. In Burns it ſeparates from the Skin, but it regenerates very eaſily again, without leaving a Mark afterwards. Its Figure and Magnitude.

Let an Anatomiſt be never ſo expert, he can never diſſect this *Cuticula*, nor ſeparate it from the Skin, in order to ſhew it alone, unleſs he does it by burning a part with the Flame of a Candle. It is this which riſes up in large Puſtules, when Veſicatories are applied to ſome part of the Body; and when it ſeparates from the Skin of its own accord, and without any outward cauſe, it is a ſign that the part has a diſpoſition to Mortification and Gangrene. I ſay when it happens without any outward cauſe, becauſe an *Eryſipelas*, or the great Heat of the Sun ſometimes will make it ſeparate from the Skin, but then Nature repairs it again quickly. That the *Epidermis* cannot be diſſected.

Its Colour is different in divers Countries; for the French have it white, the Spaniards tawny, the Moors Its Colour.

black, and ſo of others. This Colour of the *Epidermis* is always derived from the nature of the Skin underneath. Thoſe who are of a Sanguine Complexion, have a ruddy Skin, mixed with white; the Cholerick have it dry, and drawing to a pale Yellow; the Phlegmatick have it ſoft and white; and laſtly the Melancholick have it rough, brown, and dark. All theſe Colours are imprinted on the *Epidermis*, which being only a very thin Pellicle and commonly white, does eaſily receive the Colour of the Skin which it immediately covers.

It contributes to Beauty.

This Part contributes very much to Beauty, for the thinner, ſmoother, and more diaphanous this is, the more beautiful is the Complexion; it ſometimes becomes thick and callous, and then it is the leſs ſenſible of touching. It is perforated in many places of the Body, like the Skin: for beſides its great Apertures, it has likewiſe abundance of ſmall Pores throughout its Extent, both for Sweat and inſenſible Tranſpiration, as well as for the ſhooting of Hair.

Its Uſes.

The Uſes of the *Epidermis* are, to cover the Skin, to render it more ſmooth and equal, to hinder the Excluſion of Humours out of the Extremities of the Veſſels which terminate upon it, and laſtly to blunt the Senſe of Touching, which could not be made upon the Skin without Pain, if the Impreſſion of Objects were to be made immediately upon the Fibres, and upon the Nerves which do end and are inſerted into the Skin it ſelf.

F F
The Skin.

The Second Tegument of all the Body is the Skin It is the greateſt Membrane of the Body; it is very thick, eſpecially in the Back, at the Kidneys, and in the Limbs, it is very thin in the Face, and exceedingly ſo in the Lips; Animals have it ſtronger than Men, and it is for this Reaſon that they are leſs ſenſible of Injuries or Impreſſions from the Air.

The Origin of the Skin.

The Ancients do pretend, that the Skin is made partly of *Semen*, and partly of Bloud, and that this is the only Membrane that is compoſed of the mixture of theſe two matters; but they are certainly miſtaken, and if Bloud be obſerved to be tranſmitted to it through many Veſſels, it is only for its Nouriſhment and Augmentation; its true Principle being to be ſought, as that of all the other parts in the Egg.

The

The Structure of the Skin.

The Enquiries of ſome curious Anatomiſts have lead us to underſtand that the Skin is formed of Fibres intertwiſted together like unto Nets, which do make its thickneſs; that there are thouſands of ſmall Glands placed under theſe Nets; that into every one of theſe Glands there comes a ſmall Branch of an Artery, that a ſmall Vein alſo comes out of them, and that a Lymphatick Veſſel going from the Gland, does paſs through theſe Nets, and does terminate at the Superficies of the Skin.

How inſenſible Tranſpiration is performed.

The Knowledge of this Structure has taught us after what manner Sweating is performed; that we ought to look upon the Skin as the univerſal Drain of the Body; and that the Evacuation which is made by inſenſible perſpiration is a very wholſome one.

The matter of Sweat.

We do find then that a ſufficient quantity of Bloud, being brought hither by ſo many Arteries as there are Glandules in it, is carried back again by ſo many little Veins; and that whilſt it is paſſing through the Pores of the Glandules, a *Serum* is filtrated from it, which coming through the excretory Veſſel, does furniſh matter for Sweat.

Scurf, how made.

We muſt obſerve that when this Seroſity is but little in quantity it dries upon the Skin, and makes what we call Scurf. The firſt of theſe Evacuations, which is Sweat, does uſe to make the *Criſis* which cures abundance of dangerous Diſeaſes. The ſecond which is inſenſible Tranſpiration, is no leſs advantageous, becauſe being made without Intermiſſion, it purifies and cools the Bloud, and makes ſuch a Diſſipation of it as is neceſſary for Life.

The Uſe of moiſt Perſpiration.

This Moiſture which is continually vented through the Pores of the Skin, the excretory or lymphatick Veſſels does alſo ſerve to preſerve the Skin moiſt, as well as the *Epidermis*, which without that would become too dry, which then would be hurtful to the Senſe of Touching.

The Pores of the Skin.

The Skin has an infinite Number of ſmall inſenſible Holes, called Pores, and others that are very evident, as thoſe of the Mouth, Noſe, Ears, Eyes, and thoſe of the *Pudenda*.

The Skin can extend and contract.

The Skin is a Membrane that can extend and contract it ſelf eaſily; we ſee how it extends in Women with Child, and in Hydropical Perſons, and in ſuch as grow exceeding big and fat. So that thoſe

who have thought it limited the Parts of the Body, have been mistaken. In Summer it is thinner and softer than in Winter, and its Pores are more open, whence it comes to pass that Transpiration is better performed in Summer than in Winter. Throughout all its Extent it adheres to the Parts which it touches; but more in the Palm of the Hand and the Sole of the Foot, than in the Forehead or Belly. It adheres more in Man than in some other Animals, which makes them able to move it more easily.

Its Adhesion.

If the Skin happens to suffer a Solution of Continuity in any part, it never reunites without making a Scar, a Mark of which remains afterwards all the Life. A Scar causes a less deformity in Infants, because their Flesh is moister than in Persons in Years, whose Skin is drier.

The Skin reunites by means of a Scar.

The Skin of a Man is covered over with Hair, that of Women is less so; and some Men have more Hair than others, We do easily discover those on the Head, Face, Arm-pits, and the *Pudenda*; but we perceive with much difficulty those that are over the Surface of all the Skin; that which appears smoothest hath in every Pore a small Hair that shoots forth, and which hath its Root in one of the small Glands that lies dispersed in the Skin. This little Hair is seen more or less, according as it is more of a fair or a dark Colour.

That all the Skin is covered with Hair.

It is needless to tell you that there have been Persons covered over with Hair like Bears, since such things are Wonders in Nature, and are no rule to us. Neither shall I relate the Reasonings of some Authors to prove that Man had no need of Hair, nor of Feathers, he having Reason and Hands for making Vestments, which were to supply their Defect.

All Men have not their Skin equally white, although that is their Natural Colour; the Colour often changes according to the Temper of the Body, and the predominant Humour, as I have already shewn when I spoke of the *Epidermis*. Fat People have it whiter, because the Fat which lies under their Skin, does give them a white Lustre. Lean Persons on the contrary have it ruddier, because the Flesh which immediately touches it, does give them that Colour.

The Colour of the Skin.

All that we Cut, in order to separate the Skin from the other Membranes, are so many small Vessels, which either go to the Skin, or else come from it; for besides those

Abundance of Vessels found in the Skin.

those of the Glands, of which I spoke, there are also those that are called Cutaneous Vessels, which are the Capillary Arteries and Veins. There are also an infinite number of small Nerves, which terminate in the Skin, and give it its Sensation.

I shall observe three considerable Uses of the Skin; the first is to cover and inclose all the Parts of the Body; the second is to be the Organ of Touching; and the third is to serve for an Emunctory to the Humours which pass forth by Sweat, and by Transpiration. I give no faith to that which the Physiognomists do assign to it, which is to be a Register of our Destiny, they fancying that they know our good or bad Fortunes, by the Features of the Face, and the Lines on the Hands and Feet. The Uses of the Skin.

The Third of the common Teguments is the Fat, which covers and incloses all the Body; it is in the Interstices of the Fibres of the *Membrana Adiposa*, and in the little Cells that are made by it, that the Fat congeals and fixes. Of Fat.

Fat is a white body, of a middle Consistence, it is made of the unctuous and oily part of the Bloud, and condensed by a moderate Cold, or rather by a certain degree of Heat, which not being strong enough to dissolve it, cannot be a hindrance to its Production. Its Definition.

It cannot be denied but this fatty matter does acquire Consistence by the Hardness and Coldness of the Membranes that fix it, and that a great heat will melt it; but since there is a difference in it, some of it being more or less solid, I shall take notice to you of four several sorts of it: of which one is called Suet, which fixes so, and becomes so hard, that it is easy to break it in pieces, when it comes to be cold, and this sort is found in great store in Beefs and Muttons, in their Paunches, and about their Kidneys. The second, or that of which I now speak, is less solid, and fixes with more difficulty than the others. The third is called *Axungia*, or Grease, and is more liquid and soft, being an Oyl thickned, and this is found in the Joints. And lastly, the fourth is a medullary Juice, which dissolves with the least degree of Heat, and then it runs like Oyl. Four sorts of Fat.

These four sorts of Fat have their different Uses, according to the different Parts wherein they are found. That which invests the whole Body, does The Uses of Fat.

keep it warm, and ſerves to preſerve its Natural Heat; Wherefore they who are very fat are very little ſenſible of Cold. That which is about the Heart does ſerve to keep it moiſt and pliant in its Motions. That which is at the Kidneys preſerves their *Pelvis* from being hurt by the Salts of the Urine; and that which is found near the Joints does facilitate their Motion by its Lubricity. Some Authors will have the Fat contribute not only to the Nouriſhment of all the Parts, when there is occaſion for it by reaſon of ſome great Abſtinence, but alſo unto Beauty, for Perſons who have little or no Fat have their Skin dry and ſubject to wrinkles.

No Fat found in the Brain.

We muſt obſerve, that there is no Fat found in the Brain, the Lips, in the upper part of the Ear, on the *Penis*, or with the Teſticles; I ſhall give you the reaſons for it in due time and place, but there is ſome of it in all the other Parts, and eſpecially about the Heart, the Kidneys, the *Nates*, and in the Joints.

We have underſtood that Fat does ſerve to moiſten the Parts, in order to facilitate their Motions, for which reaſon there is abundance of it found in places where the Motions are great and violent as at the Heart, and the Eye. It likewiſe ſerves to mollify, and to defend them againſt the hardneſs of bodies near it, as it is with the Eye. It alſo ſerves principally to ſweeten the Acrimony of the Bloud, by mixing with it, and to hinder the Exaltation of Salts, whence it is that fat people are more jocund and leſs fretful than the lean; they ſleep without the diſturbance of Dreams, whereas lean perſons are ſad, and full of Inquietudes Day and Night, by reaſon of the pungency of the Salts of their Blood, which prick them, and inflame them. This Oyl is received into the Veins and Lymphatick Veſſels. Phthiſical People are obſerved to have but little Fat in them, and their *Epiploon* is wont to be conſumed; which contributes much to their dry habit, the Salts having an Exaltation for want of this Balſamick Oyl.

The Fat changes ſometimes into Nouriſhment to the Body; and this is the reaſon that Bears, Monkeys, *&c.* do make of their Bodies Magazins of Fat, before they ſhut themſelves up in Caves in the Winter, and that we find abundance of Fat ſtored up in their *Epiploon* and Meſentery, which are as their Storehouſes,

whereas

whereas after Winter they are found exceeding lean, and their *Epiloon* and Meſentery are dried up, conſumed, and without Fat. Not that we ought to imagine that their Fat was ſufficient for their Subſiſtence, during their retirement, if theſe Creatures were not in a continual ſlumber, unleſs the motion of their Bloud was then very ſlow, as has been obſerved upon diſſecting them at that time, becauſe they being out of action, there is little Diſſipation of Humours and conſequently they have little occaſion of Nouriſhment.

Moreover the Oily Fat contained in the Veſicles of Fat does mix with the Bloud by entring directly into the Veins through their little Orifices. And M. *Malpighius* pretends to have found Veſſels for this purpoſe, which open and diſcharge the Fat into the Veins; whence it is, ſays he, that there is ſo great a Connexion between the Veins and the Fat, for this follows them in all their Ramifications, as may be plainly obſerved in the Heart, and the *Epiploon*. But this new Experiment of ſo famous an Anatomiſt, does ſtill want a Confirmation; for ſome Dutch, whoſe merit is well known, and their ſole Application to Anatomy do aſſure me that after many nice Examinations they could find out no ſuch thing.

Thoſe who ſtill admit of a *Panniculus Carnoſus*, do take the Membranous Fibres which compoſe the *Pinguedo*, or Fat, and which form the little Cells that contain it, to be this Membrane: they will have it, that in Fevers it is the ſeat of the Chilneſs that is cauſed by ſome ſharp Seroſity which makes the pungency, and that it is this which by means of its Fleſhy Fibres cauſes the Motions which we perceive in the Skin. The moſt diſcerning of the Moderns do pretend on the contrary, that the Carnous Fibres which are found in the Forehead, the *Occiput*, the Neck, and in the *Scrotum*, are the Muſcles: that if the Forehead, and the *Occiput* are moved, it is by means of the Frontal, and the Occipital Muſcles: that if the Skin of the Neck moves, it is the Cutaneous Muſcle which moves it; and laſtly, that when the *Scrotum*, and the Teſticles are ſeen to move, it is an Effect of the *Cremaſter* Muſcle. H H *Membrana Carnoſa.*

Thoſe who hold the common Membrane of the Muſcles to be one of the common Teguments of the Body, do ſhew for it a part of the proper Membrane of the oblique I *The common Membrane of the Muſcles.*

Oblique Deſcending Muſcle, which, they ſay, is white, thin, tranſparent, and made of an interlacing of Fibres and Nerves, which render it of ſo exquiſite a ſenſe, that it cauſes troubleſome Shiverings, and intolerable rheumatick Pains, when it is prick'd with ſome acid: They alſo find a Uſe for it, which is to hinder the Muſcles from being diſplaced in violent Motions, as if it were poſſible for a Muſcle that is faſtened at both ends unto two ſolid parts, to remove out of its place. But laying aſide theſe different Opinions, I have ſufficiently ſhewn, that there is no Carnous Membrane (otherwiſe called *Panniculus Carnoſus*) nor Common Membrane of the Muſcles. Let us now then come to the Proper Containing Parts.

Ten Muſcles of the *Abdomen.*

The Teguments being raiſed, many Muſcles do appear, which poſſeſs all the Anterior parts of the *Abdomen.* Theſe Muſcles are Ten, five on each ſide. Sometimes there are counted fewer, when the two Pyramidal Muſcles of *Fallopius* are not reckoned; and ſometimes more, when the *Recti* are divided into many: but I ſhall keep ſtrictly to the number Ten, which are the four Oblique, two Tranſverſal, two *Recti*, and two Pyramidal. They do all receive their Names from their Situation, and from the Order and Diſpoſition of their Fibres.

What a Muſcle is.

I ſhall not ſpeak of the Muſcles in general, until I ſhall treat of a greater number of them. I will only ſay here, that the Muſcles are Organical Parts, and the Inſtruments of Voluntary Motion, and that it is only by their means that the *Abdomen* can expand and contract it ſelf.

L

The Obliquely Deſcending Muſcles.

Of the four Oblique Muſcles, there are two of them deſcending and external, and two aſcending or internal: Thoſe which appear firſt are the Obliquely Deſcending; they are ſo called, becauſe their Fibres deſcend obliquely from above downwards. They are alſo called External, to diſtinguiſh them from the others which are ſituated under them: And laſtly, called the Great *Obliqui*, becauſe their magnitude exceeds that of the other *Obliqui.* Their figure is almoſt triangular.

The Origin and Inſertion of theſe Muſcles.

They take their Origin by Digitation from the *Serratus Major*, that is to ſay, from the ſixth and ſeventh of the true Ribs, from all the baſtard-Ribs, and

and from the edge of the transverse Processes of the *Vertebræ* of the Loins; they proceed to insert in the external part of the *Os Ilium* and the *Os Pubis*, and end with a large and strong *Aponeurosis* in the *Linea Alba*. The *Serrati Majores*, which are Muscles of the *Thorax*, have as many Indentings as these Muscles, and they do interlace one another, after the manner as the Fingers of one Hand use to be placed between the Fingers of the other Hand. At every one of these Indentings, which are seven in number, there is a little Nerve that enters into it, which causes these Muscles to be very hard to Dissect, when one would shew them all. These Nerves do likewise shew us the origin of these Muscles, because the Nerves which go to the Muscles do enter into them rather towards their origin than at their insertion.

M

The Obliquely Ascending Muscles.

The Obliquely Ascending Muscles are so called, because their Fibres do rise from below upwards; they are situated just under the former, for which reason they are call'd the Oblique Internal. They are a great deal less than the former, and are like them of a triangular figure. They have their origin from the superior part of the *Os Pubis*, continuing along the middle of the Crest of the Hip-bones, they insert at the ends of all the Ribs as far as the *Cartilago Xiphoides*, and at last insert in the *Linea Alba* by a large and double *Aponeurosis*: They do receive the Nerves at the place where they were inserted at the *Vertebræ* of the Loins.

Why these Muscles have their *Aponeuroses* double.

Of these Two *Aponeuroses*, the one passes over, and the other under the *Rectus*, that it may be equally strengthened both above and below. The Fibres of these Muscles, as well as the former, do cross one another like a St. *Andrew*'s Cross; which has the same effect as a strong compression of some Part. For Example: If one Hand be feeble, we add the other to its assistance, which crossing the former, adds unto the strengthning the other.

The Transversal are so called, because their Fibres traverse the others; they are situated under the Oblique, and placed upon the *Peritonæum*, unto which they adhere so strongly, that it is hard to separate them asunder without tearing them: These are of a quadrangular figure.

These Muscles take their Origin from the transverse Processes of the *Vertebræ* of the Loins; they insert in the

the internal part of the *Os Ilium*, and the internal part of the Cartilages of the lower Ribs; then passing under the *Rectus*, they terminate in the *Linea Alba* by a large *Aponeurosis*.

Observations on these three sorts of Muscles.

These three sorts of Muscles have *Aponeuroses*, which serve them instead of Tendons, and each of which goes and inserts with that of the Muscle which is on the other side, and this unites them so as that they seem to be but one. They are perforated in their middle part, for giving a passage to the Umbilical Vessels; and at their lower part, to let pass in Men the Spermatick Vessels, which go to the Testicles; and so in Women the round Ligaments of the *Matrix*, which proceed to make their Insertion in the Thighs.

The Mechanism of these Holes.

The three Holes which are at the *Aponeuroses* of these Muscles are so appositely made, that they deserve to be taken notice of; that of the Transversal Muscle is the uppermost of all, that of the Oblique Ascending is a finger's breadth lower, and that of the External Oblique is still lower: so that these three Holes are not placed over-against one another; and the *Aponeurosis* of one of them covers the Aperture of the other, in order to hinder the eruption of the internal parts outwardly; nevertheless, there do happen too often ruptures in those places, by the eruption of the *Epiploon* and the Guts.

O

The *Recti*.

The Fourth Pair of the Muscles of the *Abdomen* are the *Recti*, so called, because their Fibres proceed in a straight line from on high downwards, or from below upwards; for some will have them to rise from the *Sternum*, and others from the *Os Pubis*: but it is a thing indifferent whether their origin or insertion be in the one or the other of those Parts, provided we know that they are fastened at one end to the *Sternum*, and to the sides of the *Cartilago Ensiformis*, and by the other end to the superior part of the *Os Pectinis*.

Observations the Mus-

The Fibres of these Muscles do not go without interruption from one extremity to the other; but they are cut off by some Nervous places, called of old *Enervations*, although they be really true Tendons. Their

The Origin and Insertion of these Muscles.

number is not always the same, some Bodies having three of these interruptions, others four, and sometimes more.

Some would fain make so many distinct Muscles as they saw of these Membranous Intervals, because they

they had obſerved that many Nerves did enter into this Muſcle: But that ought to be the leſs ſurpriſing, ſeeing this Muſcle is long, and has a very ſtrong motion, to the performance of which one ſmall Nerve alone would not have been ſufficient.

Some Authors have related, that a Man had more of theſe *Enervations* above the Navil than below it; becauſe being more addicted to Gluttony and Intemperance, his Stomach had more need of extenſion: And that a Woman, on the contrary, had more of them below the Navil, by reaſon that this Muſcle being obliged to extend in that place, for the giving more ſpace or room to the *Matrix*, in the time of Childbearing. But this Obſervation is not found to be true, ſince both Men and Women have of them equally throughout. The Opinions of ſome Authors.

In order to underſtand rightly what are the Uſes of theſe *Enervations*, we muſt know, that every Muſcle, in its action, does abbreviate; and during its abbreviation, it ſwells in its middle more or leſs, according as its Fibres are more or leſs long. Now it is certain, that if the Fibres of the *Rectus* had extended without interruption from one end of it to the other, without being cut off ſometimes by theſe membranous intervals, the ſwelling of this Muſcle had been ſo great in its middle part, that it would have hurt and cruſh'd the Contained Parts, inſtead of aſſiſting them to make expulſion of Excrements by an equal and gentle compreſſion; the which could not happen but by the interpoſition of theſe *Nodi*, which by cutting this Muſcle into four parts, do make that inſtead of one Tumour there are four, which do equally compreſs the *Abdomen*, and facilitate the expulſion of Superfluities out of the Inteſtines and the Bladder. The true Uſe of their Enervations.

It is not only on the Uſe of theſe *Enervations* that I do differ in opinion from others, but alſo on that of the Mammillary and Epigaſtrick Veins; many having thought that one of the Branches of the Mamillary Vein which is found under this Muſcle, when it is turned up, did make an *Anaſtomoſis* with the Epigaſtrick Vein; that this communication did make the great Sympathy that there is between the Breaſts and the Womb; and that this was the way through which ſome Milk was voided from the Womb, in Women newly brought to bed. But the Circulation of the Blood No *Anaſtomoſis* in the Veſſels of theſe Muſcles.

Blood teaches us, that these Veins have no other Use than all the rest of them have, which is to convey back again the Blood to the Heart. For I have tried, by syringing Liquors into each of these Veins, to make them pass from one of them into the other, without ever being able to do it: which plainly shews, that this famous *Anastomosis*, which hath made so much noise, is nothing but a meer *Chimera*.

P

The Pyramidal Muscles.

The Pyramidal figure which the two last Muscles of the *Abdomen* have, does cause them to be called the *Pyramidal* Muscles; they lie upon the lower Tendons of the *Recti*, which hath made some think them a part of them; but they are two distinct Muscles, and separate from the others.

Their Origin and Insertion.

They take their Rise by a fleshy and very compact Principle from the upper and external part of the *Os Pubis*, and rising upwards, they contract themselves by little and little, and terminate in a point in the *Linea Alba*, three or four fingers breadth above the *Os Pubis*, and sometimes reach to the Navil.

These Muscles have a Use that is contrary to that of the others.

Fallopius, *Riolanus* and *Gelée* have assigned many Uses to them: They pretend that they fortifie the Tendons of the *Recti*, that they help the excretion of Urine, and that they contribute to the erection of the *Penis*. I do believe, on the contrary, that they serve to raise the *Peritonæum*, and to hinder the Region of the Bladder, where they are inserted, from too much compression, and that a Man be not forced to make water as often as the other Muscles do make compression on the internal Parts; these two Muscles are very small, and are never equal to one another: That which is longer than the other has its insertion a finger's breadth higher; which helps to confirm me in the opinion, that they do lift or raise the *Peritonæum* in this place, which by not compressing the Bladder, does render it capable of containing a greater quantity of Urine than otherwise it would do.

The true Use of the Muscles of the *Abdomen*.

We may consider the Oblique and the Transversal Muscles, as Hands laid one upon the other, in different sences; and the *Recti* as great Barrs situated in the middle of the *Abdomen*, which do hinder the others in their motions from too much binding and compressing the Intestines against the Spine, and the *Vertebræ* of the Loins. The *Recti* do also retain the others, and do make them to act on both sides, for the

the better compreſſion of the Parts of the *Abdomen*, for Reaſons I ſhall tell you hereafter.

Hence we ſee that the Parts of the *Abdomen* are equally compreſſed throughout, and that the Guts and the *Viſcera* cannot avoid this compreſſion, in whatſoever place they are depoſited; for the *Recti*, in their action, do ſqueeze directly before from above downwards, and thereby do conſtrain the *Viſcera* to encline towards the Sides, by reaſon of the reſiſtance they find towards the Spine. But then the Oblique Muſcles are like Diagonal Barrs, which do ſtrongly repel them: And ſince the *Coſtæ* from above, and the *Oſſa Innominata* from below, do make a good reſiſtance, the Parts of the *Abdomen* would thruſt outwardly towards the Flanks; and therefore Nature, to prevent it, has made the Oblique Muſcles very thick and very fleſhy in this place; and the more to counter-balance this reſiſtance, ſhe has here placed the Tranſverſe Muſcles, which draw the Navil towards the Loins.

It is well underſtood that the Navil is a re-union of the Tendons of almoſt all the Muſcles of the *Abdomen*, and conſequently that it is the place where all the Powers do act more ſtrongly; and this makes it to flatten it ſelf, in order to make the Belly equal in its parts; and that ſuits very well to the Uſes of the Parts of the *Abdomen*, which are ſituated in this place; for we find in it the Guts *Ilium* and *Jejunum*, and the Meſentery, which are the parts of the *Abdomen* that have moſt need of a ſtrong compreſſion: For in the former of them the Chyle does come to a ſtate of perfection, ſeparates from the groſs Excrements, and, laſtly, adapts its ſelf to the orifices of the *Venæ Lacteæ*, all which requires a very ſtrong and very vigorous compreſſion; and the Meſentery has no leſs need of it than the others, for the diſtribution of the Chyle.

The *Colon*, which is in like manner ſituated in this Region, had need alſo of a great compreſſion; for the *Fæces*, in the place where this Gut traverſes the *Abdomen*, do find it difficult to paſs forwards, both by reaſon of the aſcent they muſt there make; whereas every where elſe they have a deſcent, and becauſe here they are of a drier nature. The *Colon*.

It is not agreed in what time theſe Muſcles do thus act; it is nevertheleſs very likely that they contract themſelves in the time of Expiration. There is, notwithſtand-

withſtanding, a time in which they contract in Inſpiration, as when we are at the Stool. And thus it is; having once received Air into our Lungs, our *Thorax* being dilated, and our *Diaphragma* relaxed, we then come to hold our breath; and we make the Muſcles of the *Abdomen* to ſqueeze our *Viſcera* with the more force, which being, as it were, between two preſſes, are conſtrained to diſcharge the *Faces* they contain.

Obſerve, That in holding the Breath, the *Diaphragma* is forced to relax, the *Thorax* not being then able to contract it ſelf; becauſe there can be no expiration of Air at that time, and the *Diaphragma* can have no Tenſion: whence it is, that this being a violent and conſtrained motion, it cannot laſt long.

Q. The *Linea Alba*.

Q The *Linea Alba* is a concourſe of all the *Aponeuroſes* of the Muſcles that I have ſhewn you; it is called *Linea*, a Line, becauſe it is ſtraight like a Line, and white, becauſe it has no fleſh in it. It extends from the *Cartilago Xiphoides* unto the *Os Pubis*. We muſt obſerve, That it is ſtraighter below the Navil than above it, and that it divides the Muſcles of the right ſide from thoſe on the left ſide.

This ſhould be the place, GENTLEMEN, to ſhew you the *Peritonæum*, it being the Second and Laſt of the Proper Containing Parts: But before we open it, ſince we muſt prepare and diſſect the Umbilical Veſſels to ſhew you them at the ſame time, I remit your ſeeing them until the next *Demonſtration*.

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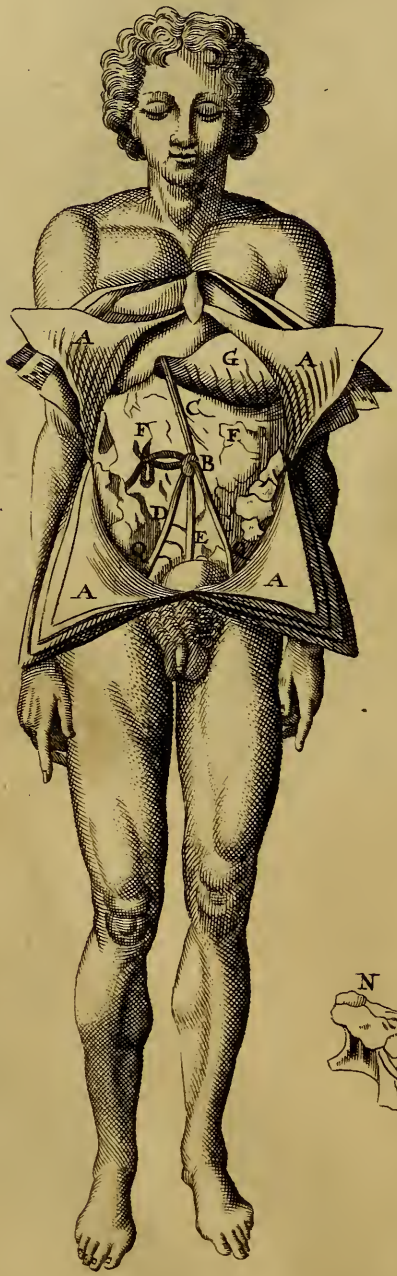
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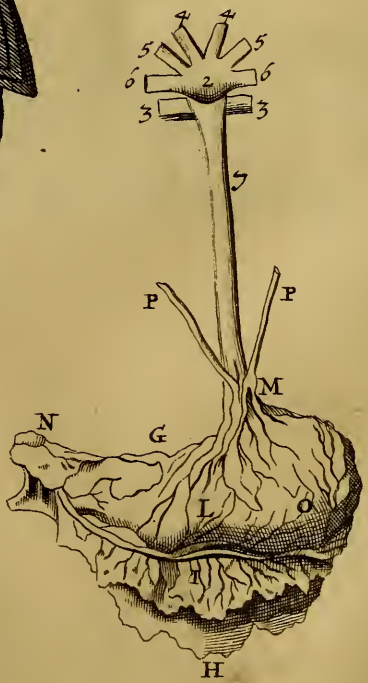
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The SECOND DEMONSTRATION.

Of the Parts contained in the ABDOMEN, *that ſerve for* Chylification.

That all the Parts of the Body are equally perfect.

IT is in this *Demonſtration*, GENTLEMEN, that I ſhall begin to examine the Parts which are encloſed in the *Abdomen*. Although this Place is the Kitchin wherein all the Nouriſhment is prepared for all the reſt of the Body, and it is the Sink through which all Impurities are drained; nevertheleſs, its Structure is no leſs admirable than that of the other Parts. An Architect who undertakes a great Edifice, is ſometimes as much concerned to diſpoſe the Kitchin, and the Offices, in convenient places, as to order the more noble Apartments; and he lets us ſee the ſtrength of his *Genius* in their conſtruction, as well as in his forming a Chamber or a Cloſet. God has no leſs made appear his great Wiſdom and Power in forming the meaneſt Parts of a Humane Body, than he does in the moſt noble, having given to the one and to the other a certain degree of Perfection which much ſurpaſſes all that Humane Underſtanding could have contriv'd or imagin'd.

Diviſion of the Parts contained in the *Abdomen*.

It being impoſſible to ſhew all the Parts of the *Abdomen* in One ſingle *Demonſtration*, I ſhall divide them into Three, by reaſon of Three kinds of Parts that are contained in it; ſome do ſerve for Chylification, others for the Purification of the Blood, and laſtly, others for Generation.

The *Peritonæum*.

But before I ſhew you any of theſe Parts, I muſt, GENTLEMEN, finiſh the ſhewing you the laſt of the Contained Parts, which is the *Peritonæum*, with the which we do commonly begin the Second Lecture or Demonſtration.

Its Definition.

The *Peritonæum* is a thin, ſoft Membrane, that encloſes, as in a Bag, all the *Viſcera* contained in the *Abdomen*. Its Internal Surface is ſmooth, and beſmear'd with a humour, which hinders it from hurting the Inteſtines, and the other Parts which it touches. The

External Surface, on the contrary, is fibrous and unequal, in order to faſten unto the Muſcles the better.

Its Figure. It has the ſame Figure and the ſame Magnitude as the *Abdomen*, which it inveſts all over. It extends as much as this capacity is able to do, in the time of Child-bearing, and in a Dropſy, or in a Tympany; and eaſily contracts again, when the Infant, the Water, or the Wind which cauſed the Tumour, are diſcharged. *Sylvius* thought this Part was ſtronger in Men above the Navil, and that in Women it is thicker below the Navil: But this opinion is not true, no more than that of the *Enervations* of the *Rectus*, ſeeing it is certain that it is equally thick throughout.

The Opinions of the Ancients about the *Peritonæum*. According to the Ancients, the *Peritonæum* is made of a double Membrane, in the duplicature of which the Umbilical Veſſels do paſs, which are the Vein, the two Arteries, and the *Urachus*. But now-a-days we know that the *Peritonæum* has no Duplicature, and that inſtead of having its Origin from the *Vertebræ* of the Loins, it is not ſo much as faſtned to them; which may be ſeen by following its track from place to place: It faſtens before unto the Muſcles, above to the *Diaphragma*, below to the *Pubis*, and paſſing over the Bladder and the *Rectum* in Men, and over the *Matrix* in Women; it covers the Spermatick Veſſels, and the *Vaſa Differentia*, without inveloping them quite notwithſtanding. Laſtly, It paſſes over the Muſcles *Iliaci* and *Pſoas*, and over the *Aorta* and *Vena Cava*, covering the Kidneys on all ſides, where it forms that Membrane which is called *Membrana Adipoſa*, becauſe it contains a great deal of Fat.

What it truly is now found to be.

The Holes of the *Peritonæum*. The *Peritonæum*, which was thought to be perforated in ſeven or eight different places, has not above two *Foramina*, or Holes, at moſt, the one above, for the entrance of the *Oeſophagus*; and the other below, for the paſſage of the *Rectum*. The ſix other Holes, that were given to it, are not to be found, to wit, two at the upper part, for the paſſage of the Great Artery, and the *Vena Cava*; one before, for the paſſage of the Umbilical Veſſels; another for the *Matrix*; and two for paſſing the Veſſels which go to the Thighs. Thoſe who ſuppoſed a Duplicature in the *Peritonæum*, imagin'd theſe Holes; but ſeeing the Great Artery, the *Vena Cava*, the Umbilical Veſſels, and the *Matrix*, are placed

placed out of the *Peritonæum*, it is needleſs to ſearch for their Entrances and their Egreſſes.

The *Peritonæum* in a Humane Body has two Productions or Elongations, one on each ſide which conduct the Spermatick Veſſels unto the Teſticles. In a Woman it covers the round Ligaments but half way. when theſe Productions are come to the Teſticles they grow larger for the better covering them, and ſo form their ſecond proper Membrane, called *Elythroides*, or *Vaginalis*, becauſe it reſembles the Sheath of a Sword. Its Productions.

It receives ſmall branches of Nerves from thoſe that are diſtributed to the Muſcles of the *Abdomen*; its Arteries come from the *Phrenica*, the Mamillary, and the Epigaſtrick Arteries; and its Veins do carry back the ſuperfluous parts of its Nouriſhment, to the Phrenick and Epigaſtrick Veins. Its Veſſels.

The Uſes of the *Peritonæum*, are to contain and to incloſe ſome parts of the *Abdomen*. It was thought that this did furniſh them all with a coat, for beſides the proper coats they had, they received one common coat, according to the Ancients, from the *Peritonæum*; and this has cauſed it to be called the Mother of all the Membranes in the *Abdomen*. Its Uſes

B

The Navil.

The Navil is a *Nodus* formed by the Re-union of the Umbilical Veſſels, and cut ſo ſoon as the Infant is born; it is called alſo *Umbilicus* from *Umbo*, that ſignifies the Middle, becauſe it is not only placed in the middle of the *Venter*, but alſo in the middle of the Body; and this is ſo true, that if a Man ſtretches out his two Arms, and ſets his Legs at the like diſtance, it will be found that theſe four Extremities do make a Circle.

What the Navil-String is.

We muſt conſider the Navil, either of an Infant whilſt he is in the Womb, or elſe in a perfect Man. In the *Fœtus*, it is a String of a French Ell long, or thereabouts, that goes from the After-birth to the belly of the *Fœtus*, and which then incloſes four Veſſels, which are a Vein, two Arteries, and the *Urachus*.

The Uſes of this String.

This String ſerves to conduct theſe Veſſels, which would have been too weak of themſelves for ſo long a paſſage, and would not have been able to reſiſt the Motions of the Infant. Its Length is of Uſe to the Infant, that he may remove conveniently to and fro in the Womb, and that both the Infant and the After-birth may come away one after another, in the Deli-

very. So soon as the Infant is born this String is to be tied within two Fingers breadth of his Belly, and then cut above the Ligature; afterwards Nature rids it self of what remains of it, so that there remains only a *Nodus*, or Knot, as you commonly see, and as we ought to consider it in a perfect Man.

Four Umbilical Vessels. The four Vessels that we call Umbilical, are annexed to it; one, which is the Vein ascends upward, and the three others, or the Arteries and the *Urachus*, do descend. These Vessels are brought from the Navil unto their Insertion between the Muscles, and the *Peritonæum*.

C The Umbilical Vein. The Umbilical Vein goes to insert in the Veiny *Sinus* of the *Cava*, to carry thither Bloud and Chyle altogether; for it is certain that this Bloud must be full of Chyle; it is that of the Mother which is abundantly filtrated in the Glandules of the *Matrix*, and in those of the *Placenta*, which from being of an imperceptible Bigness at first do afterwards become so prodigiously big, that it cannot but amaze us to see a thing so surprizing.

D D The Umbilical Arteries. The two Arteries do go, or rather do come from the Iliacks; the *Urachus* which is in the middle, goes to annex at the bottom of the Bladder.

E The *Urrchus*. I cannot Agree to the Uses that are given to these Vessels; it is pretended, for Example, that the Vein serves for a Ligament to the Liver, which cannot be for three Reasons: the first is, it would hurt the Liver rather than help it, by drawing it downwards; the second is, that it could not support it before, being fastned to the Navil, which submits to all the motions of the Belly; and the third is, because the Liver hath already a sufficient store of Ligaments in its superior part, without wanting this; unto all which may be added, that it were an ill disposition of a Ligament, for to fasten it unto a Vein, such as the *Porta*, whose coat is as thin as Paper.

The Uses of the Umbilical Vessels in a Man.

An Error concerning the Iliack Arteries. Some Authors will have the Iliack Arteries serve to sustain the Bladder; but it was unadvisedly thought, because they are removed two Fingers breadth in distance from it, and besides these Vessels being so small as they are, would be but a feeble support to the Bladder, and which little wants one at all, being to expand and swell as there is occasion.

As

As for the *Urachus*, they pretended that it ſerved as a *Ductus* for emptying the Urine of the *Fœtus* into the Membranes; but ſince I have never found it to be hollow, I do not believe it hath this Uſe. Beſides this Experiment, Reaſon will tell us, that the *Fœtus* does not make Water in the Belly of the Mother, ſeeing the Chyle which is carried to him with the Bloud for his Nouriſhment, is purified before it comes thither: and beſides, there are to be found other cauſes of the Seroſities in which the *Fœtus* ſwims, without ſearching for them in the Urine. But the true Uſe of the *Urachus* is, to ſuſpend the bottom of the Bladder, and to hinder it from falling towards its Neck, in order to contain a great quantity of Urine.

Another Error concerning the *Urachus*.

The Opinion of the Moderns is not only different from that of the Ancients on the Uſe of theſe Veſſels in a perfect Man, but alſo with reſpect to thoſe of a *Fœtus*: the Ancient Opinion was, that the Arteries did bring Arterial Blood to the *Fœtus*, and the Veins Venal Bloud; and ſeeing this Opinion is repugnant to our Principles, and to Experience, I'll tell you in few words how things are in reality: The Arteries of the Mother do carry a certain quantity of Bloud into the *Placenta*, which being therein diſperſed, is received by the branches of the Umbilical Vein, which carries it into the *Vena Porta*, to be filtrated through the Subſtance of the Liver in the *Fœtus*, before it is to enter into the *Vena Cava* that carries it into the Right Ventricle of his Heart, from whence it paſſes into the Left through the *Foramen Botalli*, in order to be afterwards diſtributed into all the Parts of the Body by means of the Arteries; the ſuperfluous part of this Bloud is brought by the two Umbilical Arteries to the After-birth, where being diſperſed, it is received by the Veins of the Mother, which are ſpread therein, and which carry it into the great Veins to circulate with the whole maſs of Bloud, and thus there is made continually a Circulation of the Bloud of the Mother to the Infant, and of that of the Infant to the Mother. And there is a certain Teſtimony that it is done after this manner, becauſe if you touch the String of an Infant newly born, you will find the ſame pulſe within it, as in its Arteries, which makes it evident, that the Bloud which runs into the Umbilical Arteries, is the ſame which comes from the Heart of the Infant, and that it

The Uſes of the Umbilical Veſſels in *Fœtus*.

is not that of the Mother, as has been believed a long time.

The Circulation plain from the Mother to the Infant.

This reciprocal motion of the Bloud of the Mother to the Infant, and of the Infant to the Mother, is manifeſt by the Structure of the Parts which ſerve for this purpoſe. If you do but make the Diſſection of a *Fœtus*, you will be of this mind.

So ſoon as the *Peritonæum* is cut, and its four Corners raiſed, as thoſe of the Teguments were before, there is ſeen a fat Membrane, which floats upon the Guts; and is called the *Epiploon*, others call it the *Omentum*, becauſe it ſerves to cover the Inteſtines.

F F

The *Epiploon*.

The Situation of the *Epiploon*.

This Membrane is under the *Peritonæum*, and upon the Guts; it goes even into their ſinuous windings; it extends from the bottom of the Stomach unto the Navil, where it commonly ends; but it happens ſometimes to deſcend unto the Lower Region of the *Hypogaſtrium*, and even to lapſe into the *Scrotum*; and then it cauſes the *Hernia Epiploceles*, which does uſe to happen oftner on the Left Side than the Right, becauſe the *Epiploon* deſcends lower on that Side. And when in Women this Membrane happens to ſlip between the *Matrix* and the Bladder, it makes a Compreſſion on the Orifice of the *Uterus*, and thereby hinders Generation, according as *Hippocrates* did obſerve. Its Weight is commonly half a pound, although *Veſalius* relates that he ſaw one of five pound Weight.

The Figure and Origin of the *Epiploon*.

The Figure of the *Epiploon* is like a Pouch, or Bag, others liken it unto a Fiſhers Net, which hath cauſed it to be called *Rete*, or Net-work. It hath in its middle part a great Cavity, that is formed by two Membranes which are removed from one another, of which the External or Anterior is annexed to the Bottom of the Stomach, and to the Spleen, the Internal and Poſterior is annexed to the *Colon*, and to the Back, under the Diaphragm.

The Fat of the *Epiploon*.

In examining this part nicely, we find in it, as well as in the *Membrana Adipoſa*, ſmall Veſſels of Fat, which ſerve for *Ductus* to the Fat, and which terminate in globules; this Fat does often melt in thoſe that have a Hectick Fever. There is here likewiſe an infinite number of Lymphatick Veins, which being broke do cauſe a Dropſie, that is not to be cured but by Punction.

The

The *Epiploon* does eaſily corrupt, when it comes to take Air, wherefore in Wounds of the *Abdomen*, we are obliged to cut off any ſuch part of it, as has had an Eruption outwards. There are likewiſe ſome Diſtempers which ſpoil and corrupt it, as it is eaſy to obſerve in Scorbutick, Phthiſical, and Hypochondriacal perſons, and in ſome others. The *Epiploon* eaſily corrupts in the open Air.

It has divers Veſſels, which are ſpread over all its Subſtance; nay it has more of them than any other Membrane, in proportion to its Magnitude; it receives ſmall Nerves from the intercoſtal branch of the Eighth Pair; it has many Arteries which come from the Cœliack Artery, and many Veins which diſcharge themſelves into the *Vena Porta*. There are alſo found in it a great quantity of ſmall Glandules, which are not placed there but for ſome particular Uſe. Its Veſſels

The Uſes that are given to the *Epiploon* are, to warm the Bottom of the Stomach, thereby to help Digeſtion by its Heat, and to excite the Fermentation of Meat in the Stomach; to cover the Guts, and laſtly to conduct the Splenick branch, and the other Veſſels, which go to the Stomach, the *Duodenum*, or the *Colon*. *Galen* relates that a Gladiator, who had his *Epiploon* cut out, was very ſenſible of Cold, and that he was fain to have his *Abdomen* covered with Wool, in order to help his Digeſtion, *Riolanus*, and ſome others do aſſure us on the contrary, that Perſons who had it cut out, were very well in health after it. This contrariety of Opinions does make me doubt of its true Uſes, and ſo much the more, ſeeing we are certain of the hurt it does by the ruptures which it cauſes, and we are in a manner ignorant of the good which it does. Its Uſes.

From the Mouth unto the *Anus*, there is a continued and very long Body, whoſe beginning gives an Entrance unto the Nouriſhment, the middle receives and preſerves it, and whoſe end gives a diſcharge unto its Excrements; this great road, through which all that we ſwallow does paſs, has divers Names. The Part which is from the Mouth unto the Diaphragm, is called *Oeſophagus*, or Gullet; that which is more large, and more capable of containing what is taken is called the Stomach; thoſe which make the Circumvolutions, are the Inteſtines, or the Guts; and the Membrane which retains them all is the Meſentery. I ſhall not demonſtrate the *Oeſophagus* until I come to the Breaſt, The long Continuity of the Guts. The different Names of Parts in this Length.

in which it is encloſed. I will begin with the Stomach, which is one of the principal parts of the *Abdomen*, and that which appears firſt after the *Epiploon* is removed.

G G The *Ventriculus*, or little *Venter*, is that which is
The Stomach. called the Stomach; it is an Organical Part, that receives the Meat and Drink, and it is the principal Inſtrument of Chylification.

The Situation and Magnitude of the Stomach. Its Natural Situation is the *Epigaſtrium*, immediately under the Diaphragm, between the Liver and the Spleen; it ſhould of right be placed in the middle of the Body, being a ſingular Part; but becauſe the Liver is greater than the Spleen, it thruſts it towards the Left *Hypochrondrium*, which it poſſeſſes almoſt entirely with its larger part; it takes up more or leſs place, according as it is greater or leſſer; for it is not of an equal Bigneſs in all Men. It is ſaid, that they who live temperately have it moderate, and that Gluttons and Drunkards have it larger: but that is not always true, ſince the Bodies of great Feeders, and great Drinkers have been diſſected, and their Stomach has been found to be very little, but to make amends, it has been twice as thick as thoſe of other Men. Women have commonly this part leſs than Men, becauſe they eat leſs; ſo that we cannot aſſign it any determinate Bigneſs: beſides, it being Membranous, it can extend and contract it ſelf very eaſily, ſeeing it can contain at a time three quarts of Wine or Water, and three or four pounds of Meat.

Its Figure and Connexion. Its Figure is round and oblong, and it reſembles a Bag-pipe, particularly when the *Oeſophagus* is left with it, and a part of the *Duodenum*. It is equally Convex and round before, but behind it makes as it were two Boſſes or Bunches, which are ſeparated by the Spine, becauſe it muſt neceſſarily accommodate its Figure unto the place which it poſſeſſes. Its External Surface is ſmooth and whitiſh, and the Internal is wrinkled and reddiſh: it is annexed above to the Diaphragm, below to the *Epiploon*, on the right ſide to the *Duodenum*, and on the left to the Spleen.

Three Membranes in the Stomach. The Stomach conſiſts of three Membranes, one common, and two proper.

H The common Membrane. The common or External Membrane of the Stomach, is much leſs thick than the two proper which it incloſes; the Fibres of this do go from one of its Orifices

Orifices unto the other; they are very ſtrong and tendinous, for hindring the two other Membranes from dilating themſelves too much. It is this that ſuſtains all the Ramifications of Veſſels that are diſperſed on the Stomach.

I The First of the Proper Coats.

The Second, or Middle Membrane, is the firſt of the Proper Coats; it is fleſhy, for its better extenſion and contraction; it hath abundance of Fibres, both ſtraight, oblique, and tranſverſal, diſpoſed after different manners; the firſt do go in a direct or ſtraight line from the Superior Orifice of the Stomach unto the Inferior, call'd the *Pylorus*; the others do deſcend obliquely from the ſides of the Stomach towards the bottom, in its Convex Surface; and the Tranſverſal do croſs the others all over its body from top to bottom. All theſe Fibres do ſerve to contract the Stomach on all ſides, in order to make expreſſion, by this means, of the Juice contained in the little Glandules of the Third Coat; and thereby to make the liquified Aliments, and all that is contained in the Stomach, deſcend by the *Pylorus* into the Inteſtines.

L The Second of the Proper Coats.

The Third Membrane, which is the Internal, is altogether Nervous, and conſequently exceeding ſenſible; it has abundance of Folds and Wrinkles, which render it the more capacious, and hinder the Nouriſhment from making too much haſte out of it into the Guts before it is perfectly digeſted.

An Opinion on the ſenſe of Hunger and Thirſt.

Some pretend, that a remainder of the Nouriſhment which was left in theſe *Plicæ* from one Meal to another, does grow ſoure and pungent; and by affecting this Membrane with its acrimony, does cauſe Hunger; and that it ſerves for a ferment to help the Digeſtion of new Nouriſhment; and that the Drineſs of the Fibres of this Membrane is that which cauſes Thirſt.

The Uſefulneſs of an Acid Juice.

Experience teaches us, that this Membrane is bedeck'd with many little Glandules, which are like ſo many Sources that pour continually into the Stomach an Acid Juice, which ſerves as a Leaven to ferment the Aliments, and as a *Menſtruum* to diſſolve them.

The Diviſion of the Stomach.

The Stomach is divided into a Convex part, and a Concave; the firſt regards the Inteſtines, and the other the *Diaphragma*. Beſides theſe two parts, we are to conſider its two Orifices, and its Bottom.

M The Superior Orifice.

The Superior Orifice is on the left ſide; it is called, by ſome, the Mouth of the Stomach; it begins where the

the *Oesophagus* ends; it is of an exquisite sensation, by reason of the multitude of Nerves which environ it: it is larger than that on the right side, because it does receive all the Aliments, and gives them entrance, though they be often but half chewed. It is situated over against the Eleventh *Vertebra* of the Back; it is closely shut by abundance of fleshy and circular Fibres at the times when it receives no Nourishment, which was a thing very necessary, not only for the better Concoction, but to hinder the Aliments from being cast up again into the Mouth, and to hinder the Fumes, that are caused by Digestion, from being offensive.

N The Inferior Orifice.

The Inferior Orifice is on the right side; it is called the *Pylorus*, that is to say, the Porter, because it gives leave to the Aliments to descend out of the Stomach. Although this be called the Inferior Orifice, it is only with respect to the other that is placed a little higher than it, and not with respect to the fund or bottom of the Stomach, since both Orifices are almost equally removed from this; it is a little bent, and sometimes it is Cartilaginous; it is very narrow, because it is full of transverse Fibres; and it is begirt with a thick Circle, as if it were a Circular Muscle, or a Sphincter, that shuts it. Nevertheless, its Action differs from that of the Sphincters of the *Anus* and the Bladder, in that those are Voluntary Actions, whereas this is a Natural one, seeing it does not depend on our Will to stop, or to let pass the Chyle. I found this Orifice in one of the King's Musicians so hard and narrow, that the Aliments, after their digestion, not being able to pass through the *Pylorus*, were forced to be cast up by Vomit, which was the cause of his Death. In the *Pylorus* there is observed an internal Protuberance, which serves it instead of a Valve.

O The Bottom of the Stomach.

The bottom of the Stomach is all that round and fleshy capacity that is between the two Orifices; it is the place that contains the Magazine of Meat and Drink, and wherein the Fermentation and Digestion of the Aliments is performed. This Bottom extends and contracts it self in proportion to the Aliments which it receives; for it takes into it as well a small quantity as a great: it is a singular Part; and if it has been found sometimes divided into two Parts, it is a Rarity, and Preternatural.

PP

The Stomach does receive the Nerves of the Eighth Pair; there are two of them which form a *Plexus* at the Superior Orifice, which do make it exceeding sensible; it also receives Nerves from the *Plexus Hepaticus* and *Intercostalis*; wherefore we ought not to wonder, if when the Brain is disordered, Vomitings do happen; nor when the Stomach is indisposed, it all the rest of the Body does sympathize. It receives Arteries from the *Cœliaca*, which brings it Blood for its Nourishment; the which Blood is afterwards carried into the *Vena Porta* by the Gastrick and Gastrapiploick Veins. These Vessels do prove the Stomach to be nourished with Blood, and not with Chyle, as some have thought. The Nerves of the Stomach.

At the bottom of the Stomach there is found a Vessel called *Vas Breve*, because it is very short; it has many small Branches, which go from the bottom of the Stomach to the Spleen, or else, according to the Use which the Ancients gave to it; from the Spleen to the Stomach; for they thought that the Spleen did send to the Stomach, by these Vessels, an Acid Juice, which operating on the Internal Membrane of the Stomach, did cause in it the sense of Hunger; that this Acid did detain the Aliments in the Stomach as long as it was necessary; and that this same Acid Juice, by its Acidity, did help their Dissolution. But this Reasoning is destroyed, when, upon examination of the Branches of this Vessel, we shall see that it has no perforation into the Stomach, and that its Branches are only of Veins which do carry back the Blood into the *Ramus Splenicus*, from whence it passes into the *Vena Porta*. The *Vas Breve*.

The Use of the Stomach being to receive the Aliments, to boil them, and to convert them into Chyle; I ought to explicate to you how this conversion is made, which is that which is commonly called *Chylification*. The Uses of the Stomach.

It has been the common opinion, that the Natural Heat was the principal Instrument of it; and that not only the proper Heat of the Stomach did contribute to it, but also that of the adjacent Parts; that all the Aliments were in it, as in a Pot, under which a great deal of Wood was put, to make it boil; and that the Liver, the Spleen, the *Pancreas*, and the *Epiploon*, were as so many Billets lighted round about the Stomach, to make Concoction and Digestion of the Aliments. The Opinion of the Ancients concerning this.

Others

Others pretended, that there was in the Stomach of every Animal a Chylifick Faculty; and that it was this same Faculty which made the Digestion of the Aliments, and converted them into Chyle.

The manner how Digestion is performed.

But it would be ignorance of the Structure of the Stomach, to have a Deference to the Opinion of the Ancients, concerning the Digestion of Aliments; since it is only requisite to know (to explain it after a Mechanical and Natural manner) that the Internal Coats of the *Oesophagus* and the Stomach are all bedeck'd with Glandules, which do continually transmit into it an Acid Juice, which is a Dissolvent as powerful in respect to the Aliments, as *Aqua fortis* is in respect of Metals. Nevertheless, we must not imagine that these Glandules are the only Fountain of this Dissolvent, there being another of them in the *Parotide* and Maxillary Glandules, from whence there do spring little Rivulets of *Saliva*, which running through the Salivary *Ductus*, do discharge themselves in the Mouth, to soak and moisten the Aliments in it, and there to begin their Fermentation, by means of the Acid Juice, and the Volatile Salts, with which the *Saliva* is replete, when it is neither too thick, nor too watry; for in such case it can neither temper the Aliments, nor procure their Dissolution, its Spirits and its Salts being either intangled and confounded in too gross a Liquor, or else drowned in too great a quantity of Phlegm. The more solid Aliments, after having been pounded in the Mouth, and penetrated with the *Saliva*, are conducted through the *Oesophagus* into the Stomach, and either by the help of the Acid Juice, both of that which they find in it, and of that which distills into it without intermission, they do become more liquid. Then this Liquor not being able to rise upwards through the *Oesophagus*, by reason of its situation, and of the *Diaphragma*'s making compression upon the Stomach, does gently run through the *Pylorus* into the Intestines, where it comes to greater perfection, by the mixture of the *Bilis* and the Pancreatick Juice, as I shall shew you hereafter, speaking of the *Venæ Lacteæ*.

That Dogs and Wolfs have a quicker Digestion.

Thus the Dissolution of Aliments in a Humane Body is performed. It is made more speedily in Animals, who have a stronger Dissolvent, as in Dogs and Wolfs, who digest Bones themselves. We agree, that this Disso-

Diſſolution is aſſiſted by the Natural Heat both of the Stomach and the adjacent Parts, and that this does facilitate even the penetration of the Diſſolvent: But we cannot agree, that it is the principal Inſtrument of it, as it has been believed, nor that there is any need at all of a Chylifick Faculty.

What cauſes Hunger and Thirſt.

Hunger and Thirſt are the two ſenſible things which do alternately agitate the Stomach: Hunger is cauſed by an Acid Liquor which trickles down, without intermiſſion, into the cavity of the Stomach, from its own Glandules, and from thoſe of the *Oeſophagus*: When this Acid finds no Aliments to prey upon, it exagitates and pricks the Membranes of the Stomach, and cauſes that which we call Hunger. And when there riſes up ſome Vapour which heats the ſuperiour orifice of the Stomach, which then enclines us to cool it with Drink, that then happens, which is called Thirſt.

QQ

The Guts.

The Inteſtines, or Guts, are long, round, hollow, and continued Bodies, from the *Pylorus* unto the *Anus*. They are ſo called from the word *Intus*, ſignifying Within, becauſe they are placed within the Body; and they receive into their Cavities the Chyle and the Excrements of the firſt Concoction.

Their Situation.

They are ſituated under the *Epiploon*, in the *Abdomen*, whoſe whole capacity they do almoſt fill, which reaches from the Stomach to the *Os Pubis*. They are knit or annexed to the Back by means of the Meſentery, which ties them together; ſo that the *Tenuia Inteſtina* are in the middle of the *Abdomen*, in the Umbilical Region, and the *Craſſa* in the Circumference.

Their Magnitude.

The Inteſtines have not all the ſame bigneſs, nor the ſame Diameter; but they have commonly ſeven times the length of the Body from whence they are taken: This great Extent, and the different Circumvolutions which Nature was obliged to give them, by reaſon of the ſmall ſpace they take up, were neceſſary both for retaining the Aliments a longer time, and for their Fermentation, by the mixture of the *Bilis* and the Pancreatick Juice, as well as to ſeparate the Chyle the better from its Excrements, and by means of theſe two Liquors to render it more fluid, more ſubtile, and conſequently to be in a better condition to paſs into the *Venæ Lacteæ*.

A Remark.

Moreover, if the Body had had but one Gut, a Man would have been forced to eat continually, as the ravenous

ravenous White Wolf and Cormorants are fain to do, becauſe they have very ſhort Guts; and it was for this reaſon that a Man who died of a Dropſie, whoſe Body I open'd, and in whom I found only ſuch a ſmall length of Guts as was neceſſary to reach directly from the Stomach to the *Anus*, did eat continually every hour all his life; he was fain every night to provide ſtore of Bread to be near him, that he might readily eat in the night-time whenever he waked.

The Inteſtines are covered with Fat outwardly; and they are within beſmeared with a *Mucus* that defends them againſt the acrimony of the Choler and Humours which continually glide within them.

The Subſtance of the Guts.

The Subſtance of the Guts is Membranous, that they might be able to extend, when they are full of Chyle, or Excrements, or *Flatus*; and that they might contract, in order to drive the Chyle into the *Venæ Lacteæ*, and to make protruſion of the Excrements towards the *Anus*.

Three Membranes.

It is compoſed, as that of the Stomach, of three Coats, one Common, and two Proper.

R

Their Common Membrane.

The Firſt is the Membrane that is called Common, becauſe it is continued with the External Membrane of the Stomach, and with the Meſentery and *Peritonæum*; it is harder and drier than the two others which it incloſes; and this Membrane does hinder the Guts from dilating too much, when they are full of *Flatus*.

S

The Firſt of their Proper Coats.

The Second Coat of the Inteſtines is Carnous, and interlaced with divers ſmall Fibres, but particularly with two ſorts of them, whereof the one are Circular, and the others direct: The Circular Fibres are placed under the Direct, or Straight Fibres, and terminate at that part of the Meſentery which touches the Inteſtines; and the Straight Fibres do traverſe the Circular at right Angles, and go to the External Membrane of the Inteſtines.

The Periſtaltick and Antiperiſtaltick Motion of the Guts.

The Periſtaltick Motion of the Guts is made by the contraction of their Fibres from above downwards, as the Antiperiſtaltick Motion happens by their contraction from below upwards. I have often obſerved in Living Animals that I have Diſſected, in order to ſee in them the diſtribution of the Chyle, that the contraction which happens in the Periſtaltick Motion (which ſome call a Vermicular Motion, becauſe it is like

to

to the creeping of Worms) does not happen in all parts of the Inteſtine at the ſame time, but one part is ſucceſſively contracted after another. This Motion is always made from above downwards, both for the diſtribution of the Chyle, and for the expulſion of the groſſer Matters. On the contrary, in the Motion that is made from below upwards, all things aſcend and come out of the Mouth, inſtead of following their ordinary courſe; and this happens in the *Miſerere*, and in Prolapſes of the Guts into the Groins.

The Second of the Proper Coats of the Guts.

The Third Coat of the Inteſtines is Nervous, like that of the Stomach; it is about thrice as long as the two others which cover it: it hath abundance of Wrinkles and *Plicæ*, which ſtill form more ſmall Membranous Circles, that ſerve to retard the motion of the Chyle, and the deſcent of the Excrements; the Arteries, the Veins, and the Lacteal Veſſels, which over-ſpread all the Meſentery, do terminate at the Internal Surface of this Coat: Its External Surface is likewiſe full of abundance of ſmall Branches of Arteries and Veins, and little Glandules, which are ranged in ſmall parcels, at convenient diſtances, in the ſmall Guts. Every one of theſe Glandules is perforated with a ſmall *Ductus*, that yields a whitiſh Liquor when they are ſqueez'd; but in the great Guts they are ſown one and one, all over their Surface: They have the figure of a Lentil, and are alike perforated, in order to furniſh a Liquor which ſerves to make the groſs Matters more fluid. The great number of Nerves which do form this Third Coat, do make it a very ſenſible Part; and for this reaſon its inſide is always full of an unctuous viſcous Humour, which has occaſioned it to be called the Velvet Coat; this *Mucus* doth moiſten and defend its Fibres againſt the acrimony of the Choler, and the hardneſs of the Excrements.

The Veſſels of the Guts.

The Guts have abundance of Nerves, Arteries and Veins, which are ſpread between their Membranes; the Nerves come from the Eighth Pair. They bring an Animal Juice, which is neceſſary for the motions of the Carnous Fibres of the Second Coat. The Arteries do come from the Superior and Inferior Meſenterick Arteries; they bring them ſtore of Blood, both for their Nouriſhment, and to be filtrated through the Glandules. The Veins go to the *Porta*, they carry back to the Trunk of that Vein the ſuperfluous Blood that remains from the Nouriſhment of the Guts. Al-

Their Division. Although the Inteſtines be but one continued body from the Stomach unto the *Anus*, nevertheleſs, they are divided into ſmall Guts, and great: the ſmall are three, the *Duodenum*, the *Jejunum*, and the *Ilion*: The great are likewiſe three, the *Cœcum*, the *Colon*, and the *Rectum*.

The Small Guts. The *Tenuia Inteſtina*, or Small Guts, are ſo called, becauſe of the tenuity or thinneſs of their Membrane: They are ſituated, as I have already ſhewn you, in the Middle Region of the Belly, about the Navil; becauſe their principal Uſe being to perfect and to diſtribute the Chyle, they can do this the more conveniently, by being near unto the Meſentery, which ties them faſt, as unto their Centre, rather than they could if they were more remote from it. Beſides, the Lacteal Veins having no long courſe to take, the diſtribution of Chyle is the better performed by them, and much the more ſpeedily.

The Great Guts. The *Craſſa Inteſtina* are ſo called, becauſe their Coats are much thicker than thoſe of the others: They are ſituated all round the Small Guts, to which they ſerve for a defence. Their Uſe is to retain, for ſome time, the groſſer part of the Aliments, and to contain the Excrements.

The *Duodenum*. The Firſt of the *Tenuia* is the *Duodenum*; it is ſo called, becauſe its length is twelve fingers breadth; which is hard to prove nevertheleſs, unleſs we comprehend the *Pylorus* in this length. It begins at the *Pylorus*, which is the right Orifice of the Stomach; and deſcending towards the Spine, it ends where the Circumvolutions of the other Guts begin; it is thicker and narrower than the others. It is of a ſtraight figure; becauſe if it had been crook'd or bent, that which comes forth of the Stomach would have found it difficult to get an entrance into this Gut. Upon the end or latter part of this Gut, or elſe towards the beginning of the *Jejunum*, two Holes are found, which are the ends of two *Ductus*, whereof one is called *Ductus Cholodochus*, and the other *Pancreaticus*. The firſt of theſe diſcharges Choler, which comes from the Bladder of Gall and the Liver into the cavity of one of thoſe two Guts; and this diſcharges the Pancreatick Juice which comes from the *Pancreas*.

The *Jejunum*. The Second of the Small Guts is the *Jejunum*, ſo called becauſe it is always found to be leſs full than the

the others, having a great quantity of *Venæ Lacteæ*, which receive the Chyle without intermission. We may add, That the *Bilis* and the Pancreatick Juice mixing together at the beginning of this Gut, or at the end of the *Duodenum*, would too quickly precipitate not only the grosser part of the Excrements, but also the Chyle, if there were not folds and turnings within, for retaining it some time, and hindring it from running with too great violence. It possesses the upper part of the Umbilical Region. It begins at the end of the *Duodenum*, and terminates at the *Ilion*, after having made many Windings below, and towards the sides. Its length is an Ell and an half, *Paris* measure.

The Third of the Small Guts is the *Ilion*, or the Gut of the Hips, so called, because it is placed in those parts. Its Colour is a little blacker than that of the *Jejunum*, and thereby it is known and distinguished from the other. It begins immediately where the *Jejunum* ends, and terminates at the *Cæcum*; it is longer alone than all the rest together, having at least twenty foot in length: it hath fewer *Venæ Lacteæ* than the *Jejunum*, for which reason it is always fuller. It possesses almost all below the Navil, and extends, by its Circumvolutions, towards the *Ilia* on both sides. This Gut not being so fast tied to the neighbouring parts, as the *Colon* and the *Cæcum*, does often fall into the *Scrotum*, and makes the *Hernia Enterocelis*. It is also in this Gut that the *Volvulus* and *Miserere* do happen, which are called *Iliaca Passio*, in which the very Excrements are vomited upwards; because then the Membranes of this Gut do enter into one another, and cause those *Nodi* which hinder the passage downwards. The *Ilion*.

The First of the *Crassa Intestina* is the *Cæcum*, so called, because being made like a Pouch, it hath but one Aperture both for ingress and egress; or else, according to *Bartholin*, because its Use is but blindly known. It is situated in the right *Hypochondrium*, lower than the right Kidney, where it is strictly annexed to the *Peritonæum*; it hath an *Appendix* that is like an oblong Worm, made up of the conjunction of three Ligaments of the *Colon*: it is bigger in Infants newly born, than when they are grown in years; which is a thing that much perplexes Anatomists, to resolve on its true Use. As for the *Cæcum*, it is pretended that it serves The *Cæcum*.

for a ſecond Stomach, in which ſome parts of the Aliments, that eſcaped the firſt Concoction, are here boiled over a ſecond time.

The *Colon.* The *Colon* is the Second of the Great Guts, and the largeſt of them all; it is ſo called, becauſe it is in this Gut that the Colick Pains are felt. Its length is eight or nine foot; it begins at the end of the *Cæcum*, towards the right Kidney, unto which it is annexed, and aſcending up to the Concave part of the Liver, where it is alſo faſtened ſometimes, it touches the Bladder of Gall, which tinges it with its Yellow colour in this place: from thence it paſſes along the inferior part of the Stomach, and faſtens to the Spleen, and the left Kidney; from whence it deſcends like an *S*, unto a little above the *Os Sacrum*, and terminates at the *Rectum*, inſomuch that it encompaſſes all the *Abdomen:* for want of the aſſiſtance of the Meſentery, it is moiſtened with many ſmall Proceſſes full of Fat: it has three Ligaments, whereof two do tie it above and below; and the third forms many ſmall Cells, which ſerve to retain the *Fæces* ſome time before they are diſcharged. At its beginning it hath a membranous and circular Valve, in order to hinder the Excrements, the *Flatus*, and even Clyſters, from returning out of the great Guts into the ſmall. This Valve may be ſeen, after having waſhed and turned the Gut inſide outwards.

An Obſervation on the Structure of the Valve of the *Colon.* We muſt obſerve, that beſides the foreſaid Valve, and the Cells that are in the *Colon*, which ſerve, as I have ſaid, to retard the deſcent of the Excrements, there are likewiſe other Valves from place to place, that are found not only in the *Colon*, but alſo in the *Jejunum*. Theſe laſt Valves, of which no body ever made mention before *Kircher*, do not ſhut entirely the whole cavity of the Gut; and becauſe they are always a little half-open, they do hinder the Excrements from too quick a diſcharge; for each of them filling but about one half of the Cavity, and being larger on one ſide than the other, their Whole is received, inſomuch that the largeſt part of the Valve below does anſwer to the narroweſt part of that above; which hinders the Excrements from falling with too much precipitation into the lower Guts.

Theſe Valvules are greater in the *Colon* than the *Jejunum*; they leſſen in proportion to their deſcent down-

downwards. It requires Skill to discover them; but in order to succeed in it, you must not blow into the Guts, because then you would see nothing at all; you must only open them, to see their inside: but you will see them still better, if you let the Guts dry beforehand.

The Third and the last of the Great Guts is the *Rectum*, so called because it descends in a straight line from the *Os Sacrum* to the *Anus*, where it terminates: it is a foot long, and three fingers big; its Coats are thick and solid? they are enclosed with a particular Covering which serves to expel the Excrements with the more force. It is fastened to the neck of the Bladder in Men, and to the neck of the Womb in Women. Its External part is moistened with a great deal of Fat, and therefore it is call'd the Fat Gut. The *Anus*, which is formed by its inferior extremity, hath three Muscles, to wit, a *Sphincter*, and two *Levatores:* The first is call'd the *Sphincter* of the *Anus*, its figure is like to that of a Ring, its bigness is two fingers breadth; it is annexed before to the *Penis* in *Men*, and to the neck of the *Matrix* in Women; and behind it is fastened to the *Coccyx*, and laterally to the Ligaments of the *Os Sacrum* and the Hips; it serves to open and shut the *Anus*, according to our will. The two others, which are called *Levatores Ani*, have origin from the inferior and lateral part of the *Os Ischion*, and insert in the *Sphincter* of the *Anus*, to lift it up again, after the expulsion of Excrements is over. The *Rectum*.

Upon syringing a Liquor into the Hemorrhoidal Arteries, I found that there were more Branches of Arteries than were needful for bringing Nourishment to this Gut; I observed, that abundance of these little Arteries did end in Glandules, with which it is overspread throughout; and that this Gut was not only the Drain of the grosser Excrements, but also, that it served to separate and carry off the greatest part of the impurities of the Blood. This great number of Vessels was necessary for purifying the Blood: but we pay dear for this service they do us, by the Hemorrhoids which they do cause.

V

The Mesentery is a double Membrane situated in the middle of the Belly, of a figure near unto circular; if the elongation of the *Colon* and the *Rectum* be excepted in it, it hath about four Fingers breadth diameter, The Mesentery.

and three *Paris* Ells in its circumference, round about which Meſentery the Guts are folded. When the Guts are ſeparated from it, it reſembles thoſe Ruffs that were anciently worn about the Neck, and which the *Swiſſes* wear ſtill; and this is the part we eat, under the name of a Calf's Chadern.

There are in this part abundance of ſmall Glands and Veſſels, which have been diſcovered in this Age: Theſe Veſſels are the Lacteal Veins, which carry the Chyle from the Inteſtines to the Glands, which are abundantly more in number in the centre of the Meſentery, than in its circumference. From theſe Glandules the Chyle does go by other Lacteal Veins into the common Receptacle, and from thence into the *Ductus Thoracicus*, in order to fall into the left Axillary Vein. The other Veſſels of the Meſentery are the Lymphaticks, which diſtill their *Lympha* into the Receptacle, in order to make the Chyle more fluid. The *Venæ Lacteæ* are true Lymphaticks, through which the *Lympha* runs when there is no Chyle in them. This *Lympha* keeps them always open, to the end that when a Body has been for ſome conſiderable time without eating, the Chyle may always find theſe *Ductus* open for its more eaſie paſſage through them.

The Fat of the Meſentery.

Fat is collected in the Meſentery, as in the *Epiploon*, from an oily and ſulphurous Blood, which evaporates from the Veſſels, and is retained there by the thickneſs of the Membranes. This Fat was neceſſary in this place, both for the preſervation of the Natural Heat of theſe Parts, and to moiſten the *Venæ Lacteæ*, which having only a very thin Membrane, and being filled only in the time of the diſtribution of the Chyle, would otherwiſe grow dry.

X The Glandules of the Meſentery.

The Glandules of the Meſentery have each of them a little Artery, which brings Blood to them, a little Vein which carries back the Blood, and an excretory *Ductus*, which diſcharges into the Guts what has been filtrated through theſe Glandules; and if at any time theſe Glands do become big and ſchirrous, it is becauſe the groſſer Humours, which come to the Meſentery, as to a natural Drain, do find the Pores of theſe Glands too clotely ſhut to get through them; inſomuch that they ſtop here, and cauſe hardneſſes, which encreaſe with time. And ſince it is ſo hard to diſſolve or diſperſe theſe Tumours, when they are of a long ſtanding,

ſtanding, ſome have thought fit to call the Meſentery the Mother that feeds and nouriſhes the Phyſicians Buſineſs.

The Uſe of the Meſentery is to tye the Guts together unto the *Vertebræ* of the Loins, and to hinder any diſorder from happening in their Circumvolutions; the Uſe of its double Membrane is in order that the Veſſels paſſing between them, may go to the Guts and return from them without being hurt in their paſſage. The Uſes of the Meſentery.

The Nerves of the Meſentery do come from the *Vertebræ* of the Loins; it likewiſe receives Nerves from the intercoſtal Branch; they are all ſo interlaced together in the middle of the Meſentery, that they form there a *Plexus*, out of which there comes abundance of Nervous Ligaments, as fine as Hair, which overſpread all the Membranes of the Guts. The Nerves of the Meſentery.

The Arteries which are incloſed in the duplicature of the Membranes of the Meſentery do come from the Superior and Inferior Meſenterick Arteries, which are two great branches that come from the Trunk of the *Aorta*, and terminate in all the Guts. One of its greateſt branches is that which runs along the *Rectum*, and ends at the *Anus*. This Branch is the Hemorrhoidal Artery, which brings a thick fæculent Blood to be purified in theſe Parts, and when this Bloud cannot return back as it ought through the Hemorrhoidal Veins, as it ſometimes happens by reaſon of its Heavineſs, it then cauſes that troubleſome Malady, called the Hemorrhoids. Arteries of the Meſentery.

If the Nnmber of Veins does appear greater than that of the other Veſſels in the Meſentery, it is becauſe thoſe Veins being full of Bloud are eaſily ſeen, and the other Veſſels being empty, cannot be perceived. According as all the Veins do approach the *Baſis* of the Meſentery, they do unite together and form larger Veins, the Union of which greater branches does form a Trunk of a Vein, called the Meſenterick Vein, which joining with another called the Splenick, do together make a very great Vein, or the *Vena Porta* ſo named by the Ancients, becauſe they thought it carried the Chyle to the Liver, there to be turned into Bloud. Its Veins.

Theſe two Trunks of which the Splenick that comes from the Spleen, is the Superior, and the Meſenterick, which comes from the Meſentery is the Inferior, do convey the Bloud to the Trunk of the *Porta*, that The Uſes of the *Vena Porta*.

was before brought to those Parts. There are four Veins which are inserted into the first of these Trunks, the posterior *Epiploides*, the *Coronaria Stomachica*, the Epiploick, and the greater Gastrick; whereas in the second there are but two inserted, which are the Hemorrhoidal and the Cæcal.

I have observed to you, that the *Vena Porta* was made of the Conjunction of these two Trunks, and that it entred into the concave part of the Liver; but it is good to know, that before it comes to the Liver, there are four Veins which come and join the *Porta*, which are the Intestinal, the Gastropiploique, the little Gastrick, and the Cystick.

Four Branches that go to the *Vena Porta*.

Two very opposite and even impossible Uses have been assigned to all these Veins; the one was to carry the Chyle from the Intestines to the Liver, and the other was to bring back the Bloud from the Liver to the Intestines. This Opinion hath been followed, until this Age, wherein the *Venæ Lacteæ* have been discovered, which do carry the Chyle from the Intestines unto the Glandules of the Mesentery; and thus the *Vena Porta* has no other Use, but that which is common to it, and all the Veins of the Body, which is, to carry back the Bloud to the Heart. I shall give you the reason when I shall shew the Liver, why the *Porta* does not rather insert it self into the *Vena Cava*, than into the Substance of the Liver. But at present it is time to speak of the *Venæ Lacteæ*, and the Lymphatick Vessels.

The Opinion of the Ancients.

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It is impossible to see the *Venæ Lacteæ* in a dead Body, because they do all disappear as soon as once they are empty. When you would see them, you must give a great deal of Meat to a Dog, and four hours after, you must tye the Dog upon a Table, and open his Belly quickly, and then you will see the *Venæ Lacteæ* dispersed through all the Mesentery, full of Chyle, which they are carrying to the Receptacle of *Pequett*.

The *Venæ Lacteæ*.

These Veins are so called, because they contain in them a white and liquid Substance, like unto Milk. They have been intirely unknown to all the Ancients, and they were never discovered till the Year 1622. by *Asellius*, who relates that these Vessels have the Substance and the Structure of a Vein: that they have one simple Membrane, wherein three sorts of Fibres have been

Why so call'd.

been obſerved, the ſtraight, the tranſverſe, and the oblique; and that this Membrane, though ſimple, is nevertheleſs ſtrong enough, becauſe it is ſecurely placed between the two coats of the Meſentery, which fortify it.

In what parts the *Venæ Lacteæ* abound.

Their Number is exceeding great, there being of them as many again as of the Meſeraick Veins; they are almoſt all in the Small Guts, becauſe they do make the diſtribution of Chyle, and do ſeparate it from the Excrements. I have told you already that the *Jejunum* has more of them than any other of the Small Guts, and that the Great Guts have but very few of them, their Uſe being to expel the Excrements, and all other Impurities of the *Abdomen*.

Two ſorts of *Venæ Lacteæ*.

The better to comprehend the Road which the Chyle takes to goe to the Heart, and not to the Liver, as the Antients pretended: We ought to know, that there are two ſorts of *Venæ Lacteæ*; the one are called the firſt Lacteals, and the others ſecondary; the firſt are thoſe which bring the Chyle from the Inteſtines unto the Glandules, which are ſpread in very great quantity through all the Meſentery, but eſpecially towards its Center.

The Secondary *Venæ Lacteæ*, are thoſe which carry the Chyle from theſe ſame Glandules (after it has been made more liquid by the *Lympha* contained in them) into the Receptacle of *Pequett*. It has received that Name, becauſe Monſieur *Pequett*, a famous Phyſician, firſt of all in the Year 1651. made the Diſcovery of it. This Receptacle is placed between the two Origins of the Diaphragm, in the place where the Lumbary Glandules are found, and which are ſo called, becauſe they are ſituated upon the *Vertebræ* of the Loins. The two branches which come from theſe Glandules, joining together, do make the *Ductus Thoracicus*, which is often found to be double. This *Ductus* aſcends along with the *Aorta*, between the Ribs and the *Pleura*, and goes and terminates by one, two, or three branches, in the Left Subclavian Vein, near unto the Axillary Vein, from whence the Chyle is carried into the Right Ventricle of the Heart, by the deſcending *Vena Cava*.

This Canal or *Ductus*, and all the *Venæ Lacteæ*, have Valvules in them from place to place; and they are diſpoſed in ſuch a manner, that they do eaſily give admittance to the Chyle, and hinder its ever returning.

The Ancients fancy'd that the Milky Veins went to the Liver.

The Discovery of the *Venæ Lacteæ* (or Milky Veins) has been of great Use to Anatomy, though at first View it did not prove so serviceable as it ought to have done, for the Anatomists of that Age, and even *Asellius* who first discover'd 'em, were so prepossess'd with the Opinion that the Bloud was form'd and prepar'd in the Liver, that they took that to be the only Receptacle of the Chyle. And notwithstanding all the Discoveries that have been made since, we have had such obstinate Sticklers for Antiquity, who upon Ocular Demonstration, would own that in the dissected Animals things stood so and so, but still maintain'd that 'twas otherwise in Man. As for my part, I am fully convinc'd, that the Case is the same in Man as 'tis in other Animals, for about Eighteen Years ago a false Coyner being condemn'd to die, I sent him some Victuals and Drink a few hours before he dy'd, and the Place of Execution being near my House, I had a Coach ready to receive his Body as soon as he was strangl'd: Accordingly I carry'd him of, and open'd him immediately, and when I came to the Mesentery found a great many of the Milky Veins full of Chyle; which to me was sufficient Evidence that 'tis distributed in Man after the same manner with other Animals.

The Obstinacy of some of the Ancients.

The Lymphatick Vessels of the Mesentery.

The Lymphatick Vessels of the Mesentery are small fine Pipes which convey the *Lympha* to *Pequett's Cistern*, in order to render the Chyle more active and fluid. Tho' these Vessels are very numerous in the Mesentery, yet they are not perceptible but when they are full of this *Lympha*, which is a pellucid Liquor like Water. They spring from the Glandules of the Liver, Spleen, and other Parts. Now the Ancients taking these Vessels for the *Venæ Lacteæ*, have been long in imagining that they convey'd the Chyle from the Mesentery to the Liver and Spleen. But in the Year 1652 *Bartholin* made it appear that those Vessels which they took for the *Venæ Lacteæ* carry'd the *Lympha* to the *Receptaculum*.

The manner of Chylification.

These Parts are employ'd in Chylification, tho' in demonstrating the Ventricle, I began to give you an Idæa of the manner in which the Chyle is made; yet 'twill be proper to touch upon it in this place, to the end that you may have a perfect Knowledge of the matter, upon the conclusion of this *Demonstration*. I repre-

repreſented to you but now the Impreſſion of Hunger: When a Man is affected with it, he calls for Victuals, conveys 'em to his Mouth and chews 'em: The Teeth aſſiſted by the *Saliva* bruiſe and mince 'em, upon which they are ſwallow'd and convey'd through the Gullet into the Ventricle where they mix with the ſame Acid Juice that occaſion'd the Senſe of Hunger; This Acid Juice penetrates the Subſtance of the Victuals, and ſplits it into ſuch ſmall Particles, that it appears as an uniform Liquor, which being ſqueez'd by the Stomach equally on all ſides, is forc'd to make its way through the *Pylorus* and ſo enter the Inteſtines.; There it meets with two other Diſſolvers, namely the Bile and the Pancreatick Juice, which are poſſeſs'd of a Vertue equal to that of the *Saliva* and the Acid Juice of the Stomach. Theſe two finiſh the Liquefaction of the Aliment, and ſplit what is yet unbroken; This done, it purſues its courſe through the Inteſtines; and in the mean time the ſubtileſt part of it which we call the Chyle, enters the Orifices of the firſt or radical Milky Veins. Theſe Veins are ſpread all over the Meſentery ſome by themſelves, others in company with the Meſeraick Veins; ſome in a ſtraight Line and others croſſing one another, and at laſt terminate in the Glands at the *Baſis* of the Meſentery, then the Chyle is taken up by the ſecondary Milky Veins, and convey'd to the Glandules that lie between the two Tendons of the Diaphragm, which were formerly known by the Name of *Glandulæ Lumbares*, and at this day are called *Pequett's Receptacle.* Here we take leave of the Chyle for ſome time, deſigning to viſit it again in the ſpace of three Days, and conduct it to the Heart, in demonſtrating the *Ductus Thoracicus.*

Of

Of the Parts contained in the ABDOMEN, *which serve to Purifie the Blood.*

The THIRD DEMONSTRATION.

Blood is made of Chyle.

IN order to know, GENTLEMEN, how the Blood is made, we must not only take a View of the Parts that transform the Victuals into Chyle and part it from the Excrements, but likewise of those in which the Blood is prepar'd and purify'd.

I gave you to know that the Chyle, which is the real Substance of the Blood, was prepar'd in the Mouth by vertue of the *Saliva*; concocted and digested in the Stomach by vertue of the dissolving *Menstruum* that resides there, and at last brought to perfection in the Intestines, by encountring the Bile and Pancreatick Juice. I likewise acquainted you that after these preparations, 'tis strain'd through the small Orifices of the *Venæ Lacteæ*, which repair to the Mesentery in great Numbers; That these Veins convey it to *Pequett's Receptaculum*, from whence it rises through the *Ductus Thoracicus* to the Left Subclavian Vein, and so glides on to the descending Branch of the *Vena Cava*, and after that to the Right Ventricle of the Heart, where its chief Transformation into Chyle commences.

'Tis to be remark'd, that though the *Saliva*, the Acid Juice of the Stomach, the Bile, and the Pancreatick Juice, are absolutely necessary towards the preparation of Chyle, yet they are useless and even prejudicial to it when 'tis transformed into Blood; for 'tis certain, that the Blood which ought to be good and soft in order to nourish the Parts, would enjoy neither of these qualities, if all the above-mention'd Liquors were mixt with it. For Instance, if that dissolving Acid, which by its sharp and pointed Particles, penetrates and dissolves the most solid Food; If that, I say, were carry'd along with the Blood, and thrown upon a Membrane in order to nourish it, 'twould operate it as it does upon the Victuals, and occasion a sense of Pain, as it happens sometimes in Rheumatisms. If Melancholy were not severed from the Bloud, 'twould

Several Liquors separated from the Blood.

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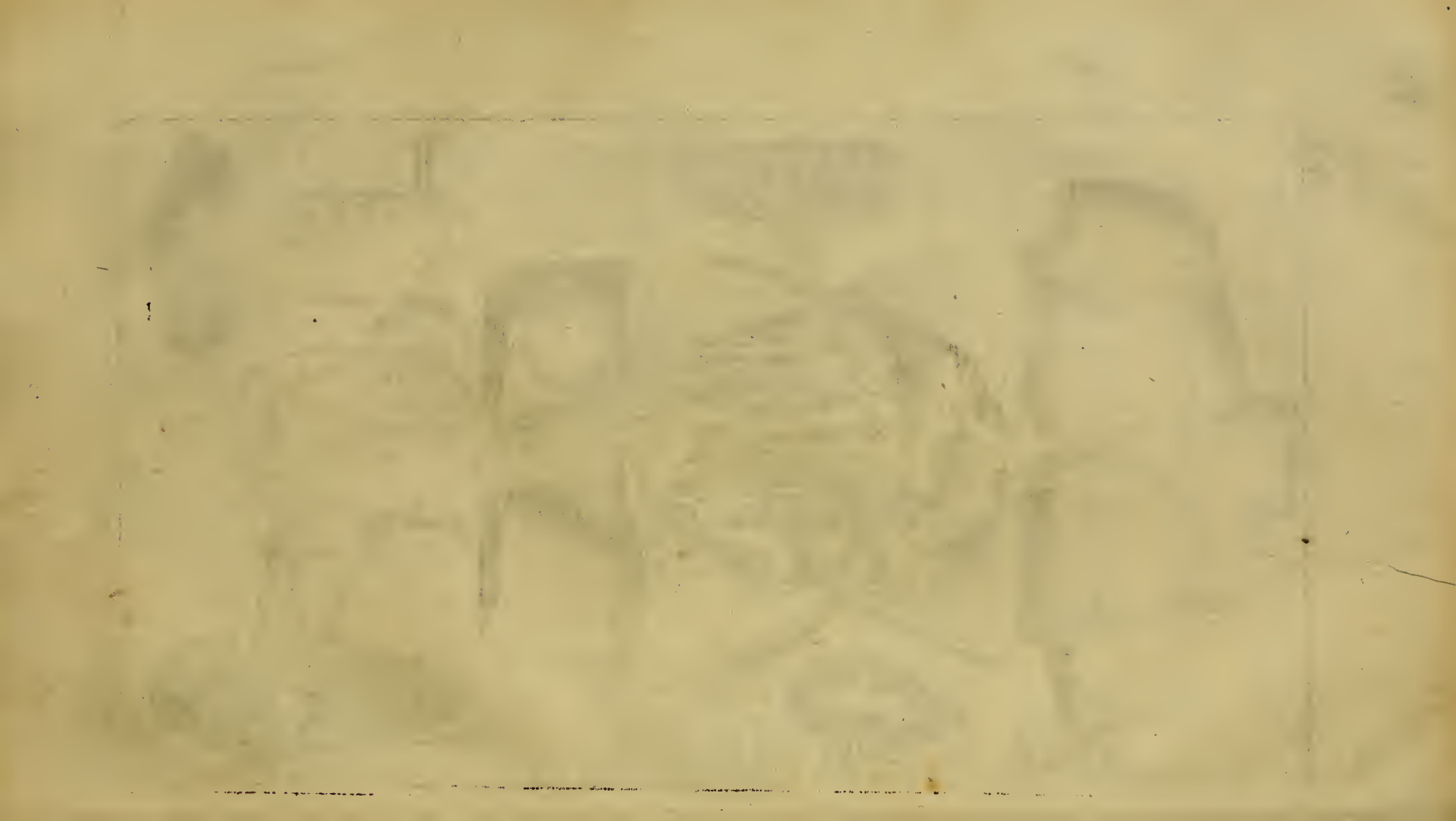

'twould be too thick; if the Urine were not evacuated, 'twould prove over ſerous: ſo that the Blood being a Liquor ſo precious and neceſſary for Life, muſt be purify'd by the Liver, the Gall-bladder, the Spleen, the Sweet-bread, the Kidneys, and the Bladder.

Of the Parts that Purifie the Blood.

Theſe are the Parts, GENTLEMEN, that are the Subject of this *Demonſtration*; for they are all ſeated in the *Abdomen*, excepting that Part which ſeparates the *Saliva*; and of that I ſhall ſpeak in its proper place.

The Liver.

The Liver is a Bowel of a conſiderable bulk, ſeated in the right *Hypochondrium* under the Midriff, at the diſtance of a finger's breadth from it; ſo that it does not incommode its motion. In a *Fœtus* it reaches to the left ſide; by reaſon that the Ventricle being never fill'd, is forced to give way to the Liver; but after the birth, it lies almoſt altogether on the right ſide. Sometimes, indeed, it extends to the left ſide, but that happens very ſeldom. A A

The Membrane of the Liver.

'Tis wrapt up in a thin tender Membrane peculiar to it ſelf; under this Membrane we ſometimes find Bladders full of Water, which are nothing elſe but Lymphatick Veſſels ſwell'd up between their Valves; and upon their breaking, occaſioning a ſort of Dropſy call'd *Aſcites*.

The Figure of the Liver.

The Figure of the Liver is almoſt round, and not unlike an Oxe's Foot: That ſide of it which faces the Midriff is Convex, purſuant to the figure of the place where 'tis lodg'd; and that towards the Ventricle is Concave. This laſt part is call'd the Arch of the Liver, and the Gall Bladder is inſerted into it.

The Liver divided into ſeveral Lobes.

In Men there is but one Liver, but 'tis divided into two Lobes; one of which is round and broad, and plac'd on the right; the other towards the left, being narrow and pointed. Theſe Lobes are ſever'd by a Cleft which gives entrance to the Umbilical Vein. Beſides theſe two Lobes, there is yet another ſmall Lobe upon the hinder part of the Liver, the fleſh of which is ſofter, and which is cover'd with a fine thin Membrane that reaches to the Caul.

The Ligaments of the Liver.

It is faſtened by two Ligaments; the firſt, which is the ſtrongeſt and the chief Ligament, ties it up to the *Diaphragma*, and penetrates into the Subſtance of the Liver, to hold it the faſter. The other is ſlack, but broad and ſtrong; it takes its riſe from the Tunicle of the

the Liver, and terminates in the *Cartilago Enſiformis*. Some give in the dry'd Umbilical Vein for a third Ligament; but I cannot agree to it: for at that rate 'twould draw the Liver downward, and conſequently the Midriff, to which 'tis tied, and ſo would hinder its motion, eſpecially in Expiration.

The Colour of the Liver. Commonly the Liver is of a Red Colour, but ſometimes we find it Pale and Whitiſh. Its Redneſs was one of the Arguments that mov'd the Ancients to aſcribe to it the office of Sanguification; but ſhall be refuted, when we come to ſpeak of the other offices they allotted to it.

The genuine ſtructure of the Liver. The Ancients allotted to the Liver a peculiar ſort of Subſtance, call'd by them *Parenchyma*; which they took to be nothing elſe than an effuſion or extravaſation of clotted Blood, which fill'd up the Intervals between the Veſſels. But the Moderns having taken a narrow view of the ſtructure of the Liver, obſerv'd that it was interlac'd with a great many ſmall Lobes of a Conical figure; that theſe ſmall Lobes were compos'd of ſeveral ſmall glandulous bodies, which have particular Membranes to unite and join 'em one to another; and that each Lobe of the Liver, though never ſo ſmall, receives a branch from the *Vena Porta*, one from the Biliary Veſſel, and a third from the *Vena Cava*. So that we may call the whole Subſtance of the Liver nothing elſe than a heap or bundle of an infinity of little glandulous bodies, and the various ramifications of Veſſels.

Five ſorts of Veſſels in the Liver. The Liver has five ſorts of Veſſels, namely, Nerves, Arteries, Veins, Biliary Pipes, and Lymphatick Veſſels.

The Nerves of the Liver. It receives two Nerves from the Eighth Pair; one from the Stomachick branch, and the other from the Intercoſtal; however, they do not pierce into its Subſtance, but only are loſt in its Tunicle, and for that reaſon its ſenſe is not ſo quick as that of the Parts which are better ſtock'd with Nerves.

The Arteries of the Liver. The *Arteria Cœliaca* ſpringing from the *Aorta*, divides it ſelf into two Branches, one of which repairs to the Liver, and the other to the Spleen. The firſt, which is the leaſt, detaches from it the Gaſtrick, the two *Cyſticæ*, the Epiploick, the Inteſtinal, and the Gaſtro-Epiploick, before it enters the Liver; where, at laſt, 'tis divided into almoſt as many ſmall Branches

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as the *Vena Porta*. Some Anatomists pretend to demonstrate, that the Branches of this Artery are wrapt up in one common Membrane with the Branches of the *Vena Porta* and those of the Hepatick *Ductus*.

The principal Vessels of the Liver are the *Vena Cava* and the *Vena Porta*, which are equally dispers'd through the whole substance of the Liver; so that each Lobe, and all the little glandulous bodies that form the hollow and convex parts of this Bowel are equally provided with these Vessels: And 'tis not to be imagin'd that the *Vena Porta* visits only the Concave part, and the *Vena Cava* only the Convex; for the Branches of both are trac'd in all the parts of the Liver. The Branches of the *Vena Porta* do not empty themselves into those which receive the Bile, or those of the *Vena Cava*, by mutual *Anastomoses*, as some Anatomists would have it; but by the intervention of the little glandulous bodies of which the Liver consists: so that the whole Liver is equally bedeck'd with the ramifications of the *Vena Porta* and those of the *Vena Cava*; but with this difference, that the Branches of the *Porta* arrive there, and those of the *Cava* set out from thence. The Veins of the Liver.

The number of the Biliary Vessels in the Liver is equal with that of the Branches of the *Vena Porta*; for the one is always accompany'd by the other, and both of 'em are wrapt up in *Glisson*'s *Capsula*. These Vessels serve to convey the Bile to the Gall-bladder, or to the *Duodenum*, of which more anon. The Bile Vessels in the Liver.

'Tis observ'd by Anatomists, that the Lymphatick Vessels in the Liver take their rise from the small Conglobated Glands that are found under the Tunicle of its hollow part, towards the entry of the *Vena Porta*, in the *Capsula* of which (*Glisson* says) these Vessels are seen to enter, though they have no communication with the Liver. This is sufficient evidence, that they do not derive their original from the *Parenchyma*, as *Bartholin* (the first Discoverer of them) imagin'd. The Lymphatick Vessels in the Liver.

These Vessels serve to carry the Lympha of these Glands to *Pequett*'s *Cistern*; and not to convey the Chyle to the Liver, as 'twas alledg'd by those who took 'em for the *Venæ Lacteæ*.

The Ancients took the Liver for the Organ of Sanguification, from whence the Blood was distributed all over the Body. Pursuant to this Notion, they asserted, that The Offices of the Liver, according to the Ancients.

that the Chyle which could not be convey'd to any other part, was carry'd thither by the same Veins which convey'd the Blood of the Liver to the Inteſtines.

Blood and Chyle cannot run in the same Chanel.

The weakneſs of this Opinion will quickly appear, if we do but conſider the oppoſite Motions that they aſcrib'd to the Chyle and Blood; for 'tis not probable that two Liquors, one of which aſcended, according to them, and the other deſcended, ſhould paſs in one Chanel at the ſame time. Beſides, the Circulation of the Blood, diſcover'd in this Age, is ſo inconſiſtent with that Diſtribution of Blood by the Veins, that inſtead of conveying it to the Parts, they are only employ'd in carrying it back to the Heart.

The Chyle does not viſit the Liver.

I was further confirm'd in this Opinion, by the Diſſecting of ſeveral living Dogs four hours after eating: For I immediately cut out the Liver, and having examin'd all the Blood that was ſpilt in the place where it lay, could not find one drop of Chyle either there, or in any part of the Liver; though at the ſame time the *Venæ Lacteæ*, the *Receptaculum*, and the *Ductus Thoracicus* were full of it. This I look upon as a certain Argument that the Chyle repairs ſtraight to the Heart, and not to the Liver.

The true Uſe of the Liver.

However, I do not aſſert, that the Liver contributes nothing towards the refining of the Blood: But 'twill here be neceſſary to ſet forth the manner of this Purification, or rather to ſhew how 'tis that the Liver ſtrains out the Bile; for though the Veſſels that unite with the Trunk of the *Vena Porta* perform the office of Veins, in carrying back the Blood: yet the *Vena Porta* ſupplies the Liver with Blood, as if it were an Artery; and doubtleſs, that which it imports, is the Subſtance or Matter of the Bile: for 'tis not probable that ſo ſmall a Veſſel as the Hepatick Artery can make a ſuitable proviſion for that effect. Beſides, 'tis well known that this Artery is employ'd in nouriſhing the Liver, which could not receive Nouriſhment from the *Vena Porta*, foraſmuch as all the Parts of the Body are nouriſh'd with Arterial Blood; whence 'tis that the Lungs, which have large Veſſels diſpers'd all over their Subſtance, have nevertheleſs an Artery of their own, call'd *Bronchialis*: And in like manner, the Heart, which has four large Veſſels retaining to its Ventricles, is

is nevertheleſs provided with an *Arteria Coronalis* for the nouriſhment of its Subſtance.

We conclude therefore, that the Blood of the *Vena Porta* having paſs'd all theſe Branches, throws it ſelf into the Glands; which open likewiſe into the Extremities of the Biliary Veſſels, the Capillaries of the *Vena Cava*, and thoſe of the Artery which convey Blood to 'em, as well as the *Vena Porta*. Now all this Blood is filtrated in ſuch a manner, that its Particles, which are proportion'd to the Shoots of the Extremities of the Biliary Veſſels, flow perpetually into 'em; after which, ſome of 'em are convey'd to the Gall-Bladder, and others to the Hepatick-Duct, and from thence to the *Duodenum*: whereas the other Particles of Blood, the figure and ſize of which is diſproportion'd to the above-mention'd Orifices, are re-conducted by the Capillaries of the *Vena Cava* into its large Trunk, and at laſt to the right Ventricle of the Heart.

'Twill perhaps be alledg'd, That if the *Vena Porta* performs the office of an Artery, in order to promote the Filtration perform'd in the Glands, it ought to have a Pulſation as well as the Arteries. But I anſwer, That though her Motion does not amount to a *Syſtole*, yet 'tis ſufficient for that effect; for, as I intimated above, 'tis enclos'd in a Muſcular Caſe, which is capable of dilating and contracting it ſelf: Beſides, 'tis always accompany'd by the *Aorta*, and doubtleſs receives conſiderable ſuccours from its continual Pulſation.

However, ſince a Filtration cannot be perform'd without the Blood be puſh'd on with ſome force, by virtue partly of the Impulſe of the Heart, and partly of that of the Arteries, as I intimated above, in treating of the Generation of the Animal Spirits; and foraſmuch as the Blood of the *Vena Porta* is groſs, and not Arterious; upon theſe Accounts, I ſay, Nature has taken care to join the Hepatick Artery immediately to this Vein, that its continual Pulſation may facilitate and augment the Motion of the Venous Blood. Nature has likewiſe confin'd theſe Veſſels within a Sheath that is capable of Motion, to the end that its continual preſſure upon the Vein may heighten the motion of Blood contain'd within it. In fine, this our Provident Mother has plac'd the Liver under the *Diaphragma* and the Muſcles of the *Abdomen*, that the courſe of the Blood might be quickned by their continual beating.

When

B The Gall-bladder. When we lift up the Liver, the Gall-Bladder, or the Ciſtern of the Gall, is expos'd to our view: This is a ſort of round Bag, ſomewhat long, and reſembling a ſmall Pear. It conſiſts of four Membranes, like thoſe of the Inteſtines: The firſt (ſetting out from the inſide) is a complication of the excretory Ducts of the Glands; the ſecond is nervous and thin; the third conſiſts of fleſhy Fibres; and the fourth is common to the Bladder and the Liver, and indeed is nothing elſe but the Membrane of the Liver thrown over the Bladder.

Its four Membranes.

Its Size and Situation. This ſmall Bladder is not commonly bigger than a ſmall Hen Egg; however, in thoſe of a bilious temperament 'tis larger than in others. 'Tis about two Fingers breadth long, and an Inch broad. 'Tis ſeated under a large Lobe of the Liver in its hollow part, where it ſinks, as it were, into its ſubſtance. There is but one Bladder in a Humane Body, at leaſt we very rarely meet with two.

Its Veſſels. The Gall-Bladder receives a ſmall Nerve from a twig of the Intercoſtal; and two Cyſtick Arteries from the *Cœliaca*, which ſplit into ſeveral Branches, and then terminate in the ſmall Glands between its two Tunicles. 'Tis likewiſe provided with two Cyſtick Veins, which take up the remainder of the Blood imported by the Arteries, and convey it into the *Vena Porta*. To all theſe we muſt add a Lymphatick Veſſel, which runs along with thoſe of the Liver to the Receptacle of the Chyle.

C The Bottom of the Gall-Bladder. The Gall-Bladder has two remarkable Parts, namely, the *Bottom*, and the *Neck*. The *Bottom* is round, and in is natural ſituation lies in the lower part of the Liver; 'tis tinctured with the colour of the Gall it contains, and often-times has ſmall Stones within it, theſe being form'd of the muddieſt part of the Bile, which petrefies by virtue of its ſtay, and the heat of the place.

D The Neck of the Bladder. Above the Bottom we meet with the *Neck*, which runs out in length and becomes ſo narrow, that it terminates in a ſmall fine Pipe which opens into the common Duct: This Pipe is call'd *Porus Bilarius*. In that place where the Neck forms this Pipe, we find a ſmall fibrous Ring, which dilates and contracts it ſelf like a Sphincter, in order to impriſon or give vent to the Gall in the Bladder, and prevent its recoiling to the

the place from whence it came. This Ring does the same service to the Bladder, that the *Pylorus* does to the Ventricle.

E

The *Ductus Cholidochus.*

The Duct call'd *Cholidochus* is a long Vessel, twice as broad as the Neck of the Bladder, which runs straight from the Liver throw the common Passage to the *Duodenum*. Some have been of the Opinion that it convey'd the Gall from the Liver to the Bladder: but for as much as the Intestine, and not the Bladder, swells when we blow into the Duct, 'tis plain that it throws the Gall directly into the Intestine, and we have reason to presume that the Gall found in the Bladder, is conveyed thither some other way.

F

The Common Duct.

The Common Duct or Passage of the Choler is formed by the joining of the *Cholidochus* and *Porus Bilarius*. It terminates obliquely in the end of the *Duodenum*, and sometimes in the beginning of the *Jejunum*, and but very rarely in the Ventricle. It runs between the two Coats of the Intestine and cuts through the outer Coat two Fingers Breadth higher than the inner. By this way of entring the Intestine it stands in no need of Valves to favour the Entry and hinder the retreat of the Choler; for 'tis impossible either for the Choler or the Chyle to rise through a Pipe thus inserted. When any Obstruction happens in this Duct, the Choler not having a free Egress flies back into the Blood, and so occasions a Jaundice, which oftentimes proves mortal.

All Animals have Choler.

Though Pidgeons and several other Animals have no Gall-bladder, yet they are furnish'd with Choler, for their Liver is bitter, and the *Cholidochus* performing the Office of the Bladder, carries the Choler straight to the Intestine.

Two sorts of Choler.

In order to a clear Apprehension of the Uses of these Parts, we must know that there are two sorts of Choler; one is subtile and fine, being convey'd by the Biliary Vessels to the Bladder, and from thence to the Intestine; the other is of a grosser Substance, and being strain'd out by the Glands of the Liver, in which the Shoots of the *Vena Porta* terminate, is carry'd by small Ducts to the *Cholidochus*, and from thence to the Common Passage, where the two sorts meet, and so repair with joint Forces to the Intestines.

The finer Choler subdivided into three sorts.

Some of the Moderns alledge, that the finer Choler is convey'd to the bottom of the Bladder by three different Roads, and indeed that 'tis in it self a mixture of three different sorts; the first is imported by the Biliary Pipes; this we spoke of but now. The second is imported by a Passage that *Blasius* calls *Singular*, alledging that it glides along between the two Tunicles, and terminates in the bottom of the Bladder: He assures us that this Passage has a Valve which favours the Egress of the Choler, and opposes its retreat. The third according to *Malpighius* is strain'd out by the Glandules residing between the two Coats of the Bladder.

The Bile is necessary for the exalting the Chyle.

If the Choler were only an Excrement thrown into the Intestines in order to be evacuated along with the Impurities of the Lower Belly, Nature ought to have inserted this Duct or Passage in the great Guts and not in the beginning of the small ones, where the greatest part of the Bile mixes with the Chyle, and is reconducted to the Blood. Now without this Bile, the whole Mass of Blood would infallibly corrupt, as it happens in most Hydropical Persons after they have had the Jaundice: Besides the Bile being a potent dissolver, compleats in the first Intestines the breaking and mincing of such parts of the Aliment as were not sufficiently dissolv'd in the Stomach, so that the Bile is so far from being a mere Excrement, as the Ancients fancy'd, that 'tis a necessary Liquor, without which the Chyle would never attain to that degree of perfection that is requisite in order to its Sanguification.

Farther, the Bile, especially that of the Gall-bladder, when 'tis thrown into the Intestines, twitches and pricks their Fibres by vertue of its Acrimony, and excites such a motion as is proper for squeezing the Chyle into the *Venæ Lacteæ*, and throwing out the Excrements by Stool. For proof of its Acrimony, we need only to consider that it congeals by mixing with Acids, and becomes more fluid when mix'd with Alkaline Oils. The acid part of the Bile is likewise very serviceable in rendring the Chyle more fluid and refin'd, and facilitating its Ingress into the *Venæ Lacteæ*; and its oily part serves for a Natural Glyster, for by greasing the Intestines, it facilitates the Descent and Motion of the gross Excrement. 'Tis well known that the Bile which passes through the *Ductus Choledochus*, flows into the *Duode-*

num

num without intermission; but we are at a loss to fix the Periods in which the Bile of the Bladder enters the Guts: However 'tis probable that this happens chiefly in the time of Digestion, by reason that upon that occasion the Ventricle squeezes it self in order to forward the Chyle to the Intestines, and at the same time stands in need of a subtilifying and quickening Force.

The Spleen is placed in the Left *Hypochondrium*, opposite to the Liver under the Diaphragm, and between the Ventricle and the Ribs, it lyes higher in some than in others; but 'tis always in the lateral and posterior part of the Body, being supported by the *Vertebræ*, and the Short Ribs. GG The Spleen. Its Situation.

'Tis very rarely seated in the Right Hypochonder. Some style it the Liver's Deputy or Vicar, upon the Plea that 'tis qualifyed for supplying its Defects; But the Actions of these two *Viscera* are so opposite, and their natural disposition so different, that it is impossible for the one to do the office of the other.

Though the Spleen be pretty large in Men, yet 'tis much less than the Liver: 'Tis about half a Foot long, an Inch thick, and three Fingers broad. In Melancholick Constitutions 'tis larger, for being spungy and loose, it bloats up as it receives the grosser part of the Blood; But the smallest is the most healthy. Its Bulk.

The Spleen bears the Figure of a Neat's Tongue; that side of it which faces the Ribs being convex, and the other hollow. Along the middle of it lengthways there runs a white Line with some small Knobs upon it, where the Arteries enter. Its Figure.

The Colour of the Spleen varies according to the Age; in a *Fœtus* 'tis red like the Liver; in Adult Persons 'tis blackish, by reason of the Melancholick Juice with which its stuff'd; in Riper Years its Colour approaches to a Lividity. In fine, 'tis more or less brown according as the Humour it harbours is more or less black. Its Colour.

The Spleen is tied to the *Peritonæum*, and the Left Kidney, and sometimes to the Midriff by very fine Membranes. But besides these Ligaments, its hollow Part is tied to the upper Membrane of the Cawl; and the whole Substance is fasten'd to the Stomach, by two or three remarkable Veins call'd *Vasa Brevia* or Short Vessels. from the shortness of their Passage. Its Ligaments.

Its Nerves, Arteries, &c. The Nerves of the Spleen are derived from the Intercostal Nerve: They do not stop at its Membrane, as the Ancients thought, but are dispersed in several twigs all over its Substance. Its Arteries are the Extremities of the Inner Branches of the *Cœliaca*, which after having rang'd all over its Substance by an Infinity of Branches, march out and are inserted in the Membrane: And 'tis upon this account that when we separate this smaller Membrane by Force, we meet with an Infinity of small red points, which are really so many drops of Blood springing from the torn Branches of the Arteries. The Veins of the Spleen having rang'd all over this Membrane, and thence detach'd a great number of small Branches interwoven like Nets; these Veins, I say, reunite and form the Splenick Branch. The Spleen is likewise provided with a large quantity of small Lymphatick Vessels, which twine round the Veins and Arteries, and then carry the *Lympha* to the Cistern of the Chyle, its course being regulated by an Infinity of Valves: This Lymph is yellow and sometimes reddish.

The Membrane of the Liver in Men. In Man the Spleen has only one Membrane, which is very thick; its Inner Surface sends out hard Fibres which run across it: All these Fibres make a Net, the Interstices of which are of different Figures: We cannot separate this Membrane without tearing it, and 'tis that which renders it rough and uneven. These Fibres are fleshy like those of the Lungs.

The Opinion of the Ancients. The Ancients took the Spleen for a *Parenchyma* made of Blood, congeal'd and thicken'd between the Fibres and the Vessels; and thought that it differ'd from the Liver only in its Substance and its Heat.

The true Structure of the Spleen. But the Moderns, after a narrower View of its Structure, have discover'd that it consists of an Infinity of Membranes, which form small Cells of different Figures, being join'd to one another by Fibres and small Vessels running across; that these Cells have a communication one with another, and contain each of 'em small white Glands of an Oval Figure, in which the Nerves and Arteries terminate; that the Membranes which form these Cells are derived from the Tunicle of the Spleen as being all one continued Texture and Production of the Membrane that immediately surrounds the Spleen.

The Vessels of the Spleen. As for the Vessels of the Spleen, it has two Nerves accompanying the Branches of the Artery, both of 'em being

being wrap'd up under one Covering; a very large Veſſel ſpringing from the *Arteria Cœliaca*, which divides it ſelf into three or four Branches that run through the Cells, and at laſt terminate in the ſmall Glands I mention'd but now; and ſmall Veins ſpringing from theſe Glandules, which by joyning together form large Veſſels. Now theſe large Veſſels upon their departure from the Spleen, unite, and ſo make the *Vena Splenica*, which after receiving four Branches by the way, terminates in the *Vena Porta*.

H

The Spleen ſtrip'd of its Membrane.

If you deſire to ſee the Diſtribution of all theſe Veſſels in a Spleen as well as a Liver, do but ſtrip 'em both of their Membranes, and beat 'em upon a board, pouring water on continually; for by this means having diſſolv'd and waſh'd away what fill'd up the Intervals between the Veſſels, you'll have an opportunity of admiring the prodigious quantity of theſe Veſſels, and their induſtrious Fabrick.

Different Uſes aſſign'd to the Spleen.

Anatomiſts are ſo divided upon the Uſe of the Spleen, that one may ſafely ſay they know nothing of the matter. The Ancients made it the Ciſtern of the Melancholick Humour, (as the Gall-bladder is of the Bile) upon the plea that the Blood they found in it was black, but one can ſcarce underſtand what they mean by their Melancholy; not to mention that we know of no Cavity for containing that Humour, and can aſſign no uſe for it.

Others were of the Opinion that the Spleen was employed in filtrating ſome ſharp Acid Humour, to be thrown into the Ventricle by the *Vaſa Brevia*, in order to promote Digeſtion, raiſe the Appetite, and put the Aliment into a Fermentation. But this Opinion can never ſtand; for the *Vaſa Brevia* being nothing elſe but Arteries and Veins, the one detach'd from a Trunk before they enter the Spleen, and the others gather'd into a Trunk before they depart from its Subſtance; theſe I ſay, can maintain no communication or commerce between the Stomach and the Spleen. The Arteries indeed may ſerve to convey Blood to the Ventricle; but that Blood does not come from the Spleen, in regard the Trunk had not reach'd the Spleen when theſe Branches were detach'd, ſo that they cannot tranſport any thing from the Spleen to the Stomach. The Veins are far leſs chargeable with it, for they carry the Blood from the Ventricle

tricle to the Splenick Trunk: Now that Trunk cannot throw Blood into the Spleen, for it carries the Blood from it to the *Vena Porta*. 'Tis therefore a neceſſary Concluſion, That the *Vaſa Brevia* are only in the ſame capacity with all the other Veſſels of the Body, the chief Office of which is to ſupply the Parts with Blood, for their Nouriſhment, under the name of Arteries; and carry off what remains, in the form of Veins.

In fine, We have a convincing Argument againſt this Opinion, in the caſe of Dogs whoſe Spleens are cut out; for they are ſo far from wanting an Appetite, that they eat more than other Dogs. But perhaps the Queſtion may be put, How it comes that Splenetick Perſons are great Eaters? Now that proceeds from the predominant Acid in their Blood, which being thrown into the Stomach, twitches its Membranes, and ſo heightens their Appetite. And 'tis the ſame Acid prevailing in their Blood, that by galling the Nerves, occaſions the unſufferable Pains they are liable to

But after all, though we ſhould meet with no Glands in the Spleen qualify'd for Filtration, yet we cannot brand it for a uſeleſs Part: The Blood may receive ſome Alteration there, that may facilitate the Secretion of the Bile in the Liver. In earneſt, Filtration ought always to be uſher'd in by Precipitation; that is, the *Moleculæ*, or little Particles, ſhould be already ſeparated, before they come to the Strainer: Thoſe of the Bile, for inſtance, ought to be parted from thoſe of the Blood, before they arrive at the Glands of the Liver.

This, perhaps, is the grounds that the Chymiſts go upon, in admitting of Ferments for all Filtrations, calling the Ferment of the Liver a Saline Sulphureous Subſtance; becauſe they obſerv'd two ſorts of Principles in the Bile, one Saline, and the other Oily, and went upon this Maxim, *Salina Salinis, Oleoſa Oleoſis ſolvuntur.* But there's no occaſion for Ferments in the Precipitations perform'd in a Humane Body: For in all the Parts calculated for Filtration (excepting this) we meet the great Impulſe of the Heart, the Spring of the Arteries, *&c.* which in their long paſſage continually laſh the Blood, and ſo diſunite the various *Moleculæ* that ought to be parted.

Now,

Now, in regard the Impulsive Force is but very weak in the Spleen, Nature, by way of Compensation, has appointed this Precipitation, and draws these two Principles of the Bile from two different Sources: The first, namely, the Oily Part, is deriv'd from the Cawl, where all the Veins lie under a very close connexion with the Fat, and receive this Oil from it. The other Principle is owing to the Spleen, by reason of the numerous Spirits that join the Blood there. In a word, we see two great Strings of Nerves terminating in the Spleen; to which we may add, that the Blood, by its stay, gives the Saline Part an opportunity of disingaging it self; and 'tis upon this account that the Spleen has indeed a very large Artery: but the Veins being much more considerable, and the Cells being capable to hold a great deal more Blood than the Artery can furnish, 'twill follow, that the Blood thrown out of the Capillaries of the Artery into these large and vast Cells, must needs make some stay there: For it is a standing Rule in the Mechanicks, that when any Liquor runs out of a narrow Chanel into a wider, it loses some part of its motion, and runs more slowly. Now, if we consider its stay in this place, added to the continual beating of the Fibres of the Spleen, which supply the want of the impulse of the Heart, and the Spring of the Arteries, we cannot but own that 'tis altered, and receives some Preparation. For 'tis plain, that when Nature means to prepare any Liquor, she drills it on through long and winding Chanels, that the prolonging of its stops may encrease the alteration.

The Animal Spirits which repair incessantly to the Spleen through these two Wreaths of Nerves that I mention'd above, promote this Preparation of the Blood two ways. In the first place, by mixing with the Blood, they attenuate and subtilize it, as being Nature's sharpest Tools. In the next place, they put in motion the Muscular Fibres of the Spleen, which grind the Blood, like so many Mill-stones. Upon the whole, we conclude, that the most probable Use we can allot to the Spleen, is that of Preparing the Blood for an easie Filtration in the Liver; and that this Preparation consists in attenuating, refining and grinding the Blood, and disingaging from it the Saline Particles of the Bile. 'Tis for this reason, that the Spleen and the Cawl, which contribute to that Filtration, are met

with in all Animals; and both the Veins of the one and the other march up and empty themſelves in the *Vena Porta*, though the *Cava* is often-times nearer to em.

The *Pancreas*. The *Pancreas*, or Sweet-bread, is a body compos'd of a great quantity of Glands wrapt up in one Membrane. 'Tis ſeated under the lower and back-part of the Stomach, near the firſt *Vertebra* of the Loins. It reaches from the *Duodenum* to the Spleen, the principal part of it being in the left Hypochonder. 'Tis tied very faſt to the *Peritonæum*, and weighs about five Ounces. Commonly it has ten Fingers breadth in length, one in thickneſs, and two in breadth.

Its Situation and Magnitude.

Two ſorts of Glands in the Body. The Moderns allow only of two ſorts of Glandules; to which they reduce all others, excepting thoſe of the Kidneys They call the one *Conglobate*, and the other *Conglomerate*. The *Pancreas* being a Member of the laſt claſs, I ſhall here take occaſion to ſet 'em both in a clearer light.

Conglobated Glands. The *Conglobate* Glands are thoſe which are undivided, being of one ſubſtance and compoſition, which appears firm and continuous, with an even ſmooth ſurface. All of 'em are furniſh'd with an Artery that imports the Blood, and a Vein that exports it after Filtration. They are likewiſe provided with excretory Veſſels, ſometimes one, ſometimes more, which carry off the Liquor of the Secretion. Some of em have a Cavity in the middle; and Lymphatick Veſſels, that empty themſelves either in the Receptacle or the *Ductus*.

Conglomerate Glands. The *Conglomerate* Glands are compos'd of ſeveral little bodies, or glandulous Kernels, join'd under one Membrane; ſuch are the Salival Glands, the Lachrymal, the *Pancreas*, and the Glands for Tranſpiration: Each of theſe Glands has, beſides Arteries, Veins and Nerves, an Excretory Veſſel ſpread through its Subſtance, by which the Liquors prepar'd by Secretion are convey'd to their reſpective Ciſterns.

The Uſe of the Glands. The Ancients were ignorant of the Uſe of the Glands; they thought they only ſerv'd to ſupport and keep up the Diſtribution of the Veſſels: 'Tis probable they did not give themſelves the trouble to enquire whether theſe Veſſels entered into the Glands or not; for if they had, they would have diſcover'd that all the Glandules in the Body ſeparate ſome Liquor or other by their Natural Diſpoſition; juſt as a Sieve grants paſſage

through

through its Holes to ſuch Particles as have a proportional figure.

The Liquors ſtrain'd out by the Glands have different Uſes; ſome are employ'd in diſſolving, others in moiſtening, and a third ſort are doom'd to be voided. The Uſe of the Liquors.

The Sweet-bread being one of the Conglomerate Glands, is furniſh'd with all ſorts of Veſſels, namely, a Nerve from the Intercoſtal, Arteries from the *Cœliaca*, Veins leading to the Splenick Vein, and Lymphatick Veſſels which run to the *Receptaculum*. The *Pancreas* a Conglomerate Gland.

Beſides all theſe Veſſels, it has a peculiar Duct, call'd the *Pancreatick*, and diſcover'd *A. D.* 1642, by *Virſungus*, a celebrated Anatomiſt at *Padua*. This Duct or Paſſage is Membranous. When you lay it open, it preſents you with a Cavity, which eaſily receives a ſmall Probe that may be conducted to the *Duodenum*; for it opens into that Inteſtine juſt by the Orifice of the Bilary Paſſage; nay, ſometimes the two Paſſages have but one Orifice. The facility of conducting the Probe all along the Cavity to the Inteſtine, and the difficulty of getting it in, when we mean to thruſt it the oppoſite way, towards the Spleen; this, I ſay, makes it to appear that the Paſſage leads only to the Inteſtine. The Liquor it conveys thither ſeems to be Yellow, by the colour of the Probe when 'tis drawn out. The Pancreatick Duct.

This Paſſage does not come from the Spleen, for it does not touch it; but from the Branches of the ſmall Glands, of which the Sweet-bread is compos'd; for the Paſſage enlarges in proportion to the uniting of theſe Branches. It terminates in the *Duodenum*, where its Orifice is guarded by a Valve allowing an *exit* to the contain'd Liquor, and oppoſing the entrance of the Chyle, and other Liquors contain'd in the Inteſtine. There is but one Paſſage of this nature, or at leaſt 'tis very unfrequently ſeen double. In its natural ſtate 'tis no bigger than a ſmall Quill, but ſometimes 'tis preternaturally enlarg'd. This Paſſage penetrates into the *Duodenum*.

As for the Uſe of the *Pancreas*, it ſerves neither for a Cuſhion to the Ventricle, nor for a Support to the Veſſels diſpers'd over the *Abdomen*; but by virtue of its Glands, to ſeparate and ſtrain out an acid Juice, to be convey'd through the Duct to the *Duodenum*, where it acts a Diſſolving part in conjunction with the Bile, and finiſhes the Refining of the Chyle. The Uſe of the *Pancreas* and Pancreatick Juice.

Before

Capſulæ Atrabilariæ. Before we proceed to the Kidneys, we muſt take notice of two Parts, call'd by ſome *Capſulæ Atrabilariæ*, becauſe an Humour reſembling the *Atra Bilis* is ſometimes found in their Cavity. Others call them *Renes Succenturiati*, becauſe their figure is commonly the ſame with that of the Kidneys. Others again call 'em *Glandulæ Renales*, becauſe they have a Glandulous ſubſtance, and are ſeated in the neighbourhood of the Kidneys.

Their Situation. There are two of 'em, one on each ſide. They are plac'd ſometimes above the Kidneys, and ſometimes between it and the great Artery. They are encloſed in a very thin Membrane, and entangled in Fat, which occaſions the difficulty of tracing 'em: That on the right ſide is commonly leſs than the other. Either of them is as big as a Wall-nut laid flat, and has a Cavity large enough, in proportion to its bigneſs. In a *Fœtus* they are generally as big as the Kidneys.

Their Subſtance. Their Subſtance is ſcarce different from that of the Kidneys, excepting that 'tis ſomewhat ſofter, and more flaggy. It eaſily breaks, when one endeavours to ſeparate 'em from the outer Membrane of the Kidneys, to which they are knit very faſt.

Figure. Their Figure is as inconſtant as their Situation: They are ſometimes round, oval, ſquare, triangular; or to ſpeak more properly, they have no determin'd figure.

Colour. Their Colour is ſometimes Red, ſometimes the ſame with that of the Fat in which they are wrapt. In their Cavity they have ſmall Holes which penetrate through their Subſtance.

They have a Nerve deriv'd from the Intercoſtal, which makes a *Plexus* in this place; one or two Branches detach'd from the Emulgent Artery, and ſometimes from the *Aorta*, and a ſmall Duct inſerted into the upper part of the Emulgent Vein. Their Cavity has a Valve which opens towards the Emulgent Vein.

The Uſe of the *Capſulæ*. Though the Uſe of the *Capſulæ* is not yet diſcover'd, we may nevertheleſs make our Conjectures from their Structure, and the Liquor they contain. I advance therefore, That probably they are Glands that make a Secretion of ſome Humour from the Blood, imported by the Arteries. That this Humour is afterwards conducted by their Small Vein to the Emulgent Vein, and

and there mix'd with the Blood, is plainly made out by the disposition of the Valve I mention'd but now; for it favours the course of the Humour to the Emulgent Vein, and hinders the Blood from flowing out of the Emulgent into the Cavity of the Glands.

The knowledge I have of the Structure of these Glands, prompts me to make this advance concerning their Use, which I take for truth. I affirm, That as soon as the Infant is born, their function is superseded; That they perform the office of Kidneys to the *Fœtus*, by separating the Serosity of the Blood imported by the Arteries, and then conveying it to the Emulgent Veins by the Duct that terminates in them. If this Opinion be well consider'd, we shall find that every Circumstance favours it. In the *Fœtus* they are very large, because then is the season of their Action; and as Age advances they dwindle, as being then useless. And as for the Kidneys in the *Fœtus*, they cannot make a Secretion of the Serosity of the Blood; and that for two Reasons. The first is, That if it were so, the *Fœtus* would be obliged to void Urine: The next is, That by that means the Blood would become too thick, the loss of the *Serum* not being repair'd by Drinking. Now the *Glandulæ Renales* obviate both these Inconveniencies; they separate the *Serum* before it can reach the Kidneys, and throw it into the Emulgent Veins, that its mixture with the Blood may render it sufficiently fluid, in order to a regular Circulation.

The Parts that separate the *Serum*.

The Parts which purge the Blood of the superfluous *Serum*, call'd Urine, are of three sorts; namely, the Kidneys, the Ureters, and the Bladder: The first make a Secretion of the *Serum*; the second convey it to the Bladder, as soon as it's separated; and the Bladder serves for a Cistern where it's kept for some time, and evacuated when it swells to a sufficient quantity.

The Reins.

The Substance of the Kidneys is much harder than that of the Liver or Spleen: They are call'd *Renes*, from the Greek word Ῥεῖν, *to flow*; because the Urine flows incessantly into the *Pelvis*. They are two in number; and some Anatomists give this reason for their plurality, That when the one is indispos'd, the other might supply its defect. But that is not a satisfactory Reason; for at that rate, Nature ought to

to have made all the Parts of the Body double, since they are all liable to disorders: It ought, for Instance, to have made two Hearts, that when the one puts a period to Life, the other might continue it. So that the alledg'd Reason wou'd be Nature's Motive. The true Reason seems to be the Perfection of the Work perform'd by these Parts; for though one Liver separates the Bile, one Spleen refines and exalts the Blood, and one Sweet-bread filtrates the Pancreatick Juice; yet in regard that the quantity of these Humours is not equal to that of the *Serum*, Nature has provided two Kidneys for the Secretion of it, one being insufficient. However, about ten years ago I dissected a Man that had but one Kidney, which was larger than ordinary, and seated in the middle of the *Abdomen*.

Their Situation. The Kidneys are seated in the Region of the Loins, one on the right side under the Liver, and the other on the left under the Spleen: They lie under the *Psoas* Muscle, upon the sides of the *Aorta* and *Vena Cava*, without the *Peritonæum*. They are not directly opposite one to the other; for if they were, they would keep up the Serosity imported by the Emulgent Arteries, and so stop its course: But the right one is commonly lower than the left, both for this reason, and for that it lies under the Liver, which takes up more room, and descends lower than the Spleen: They are plac'd at the distance of about four fingers breadth one from the other.

Their Connexion. They are fastened to the *Vena Cava* and the Great Artery by the Emulgent Arteries and Veins, and to the Bladder by the Ureters. The right Kidney is knit to the Gut *Cœcum*, and sometimes to the Liver: The left one is tied to the Gut *Colon*, and sometimes to the Spleen.

Figure. Their Figure resembles that of a Half-Moon, or a Bean, or an *Asarum* Leaf: That side which faces the Vessels is hollow, the opposite side being convex.

Bigness and Colour. Often-times one of the Kidneys is bigger than the other; sometimes the right, and sometimes the left. Commonly they are four or five fingers breadth long, three broad, and two thick. Their Surface is smooth and soft, like that of the Liver. Their Colour is a dark Red, at least 'tis very seldom that they have a sparkling Colour.

They

They are cover'd with the *Peritonæum*; beſides which, they are immediately cover'd with a proper Membrane that keeps all their Glands in their natural order. This Membrane is very thin. Some alledge, 'tis a continuation of the Tunicle of the Veſſels inſerted in the Kidneys, which, by dilating themſelves, line their inſide; and then turning back upon the outſide, cover that too. They are always cover'd with a great deal of Fat. Their peculiar Membrane.

Each of 'em receives two Nerves; one from the Stomachick Branch, which ſpreads it ſelf along the Membrane; and another from the neighbourhood of the Meſentery, which enters the hollow part of the Kidney, and is loſt in its Subſtance. 'Tis theſe Nerves that occaſion the Vomitings retaining to Nephritick Pains. Their Nerves.

The Trunk of the *Aorta* ſends out two large Arteries, which repair to the Kidneys; but before they enter the Kidney, they divide themſelves into three or four Branches, which paſs through the ſubſtance of the Kidney by its hollow part, and are loſt in an infinity of little Glands, to which they convey the Blood and its *Serum* promiſcuouſly mix'd. P P Their Arteries.

The Blood imported by the Arteries to the Glands, that cannot paſs through the Orifices of theſe ſmall Pipes, is taken up by the Branches of the Emulgent Vein, which conducts it to the *Vena Cava*. Q Q Veins.

I have open'd this Kidney lengthwiſe, that you may ſee its inner ſtructure. Its Subſtance is red, hard, and of a particular conſiſtence, there being none like it in the whole Body. You may examine the Diſtribution of the Arteries repairing to the whole Circumference, and returning to theſe ſmall Mammillary Bodies, eight or ten of which are expos'd to your view: They are call'd *Mammillares*, becauſe they reſemble the Nipple of a Woman's Breaſt; only they ſhoot out a little to a point where they are perforated, in order to let the Urine fall into the Baſin. A Kidney laid open.

The *Pelvis*, or Baſin, is a Cavity made of the upper end of the Ureters, which dilates it ſelf in the hollow part of the Kidney, and then becomes narrower in the form of a Funnel, the narrow part of which marches out of the Kidney, and makes the beginning of the Ureter. Its office is to receive the Urine that diſtills from the Nipples. The *Pelvis*.

Authors

The Uſe of the Reins. Authors are not divided upon the Uſe of the Kidneys. They all agree that they make A ſecretion of the Bloud; ſo that all the Difficulty lies in adjuſting the manner in which 'tis performed, without recounting the different Opinions of the Ancients upon that head, I ſhall only tell you that the Glands which make almoſt the whole Subſtance of the Kidneys, receive the Blood by the Branches of the Emulgent Arteries, and ſeparate the Urine from it by vertue of the configuration of their Pores. When the Urine is thus ſeparated, they empty it into ſeveral ſmall Pipes, which re-unite and ſo form the Mammillary Pyramids; from whence it diſtils into the *Pelvis* and ſo falls through the Ureters into the Bladder.

S S The Ureters. The Ureters are two Canals of a peculiar form, which ſpring upon each ſide from the *Pelvis* of the Kidneys, and are cover'd with the *Peritonæum*. They terminate in the Bladder not far from its Neck. But 'tis obſervable that theſe Canals or Paſſages are furniſh'd with Annular Fibres, which enable them to contract themſelves and ſo to facilitate the courſe of the Urine into the Bladder.

Their Size and Figure. Their Length is equal to the Interval between the Kidney and the Bladder. Their Natural Bigneſs is equal with that of a Writing Pen; but in the caſe of Nephritick Pains, their Cavities are ſometimes ſo dilated as to receive ones Little Finger. In Figure they reſemble an S.

Their Membrane and Veſſels. They are compos'd of a Membrane peculiar to themſelves, which is very ſtrong. They are furniſh'd with Nerves from the Intercoſtal Branch, which entitles them to an exquiſite ſenſe, and occaſions the unſufferable Pains that attend the Gravel. They receive Branches of Arteries from the neighbouring Parts, and return 'em ſmall Veins.

Their Origin and Inſertion. Some alledge that theſe Ureters take their Original from the Bladder, which has a white and Membranous Subſtance as well as they; But, as I take it, they derive their Original from the Kidneys; for the beginning of all Conduits muſt be calculated from the place where they take up their Liquor, and their end falls to the place where they drop it; ſo that they commence at the end of the *Pelvis*, upon their *Exit* from the Kidneys and terminate in the Bladder, which they perforate very artificially; for having pierc'd through

through the outer Membrane, they run for two Fingers breadth between the two Membranes, and then perforate the inner one near the Neck of the Bladder. By this contrivance the Urine having once enter'd the Bladder, cannot return the way it came, the Orifice of one Membrane being ſtop'd by the other.

The Ureters are of Uſe to receive the Urine ſeparated in the Kidneys, and convey it to the Bladder. Their Uſe.

T

The Bladder is a Membranous Part which forms a conſiderable Cavity, fit to contain the Urine and the ſolid Bodies that are preternaturally bred in it, ſuch as Stones, *&c.* The Bladder.

'Tis cover'd with the *Peritonæum*, and ſeated in the middle of the *Hypogaſtrium*. in the large Oval Cavity form'd by the *Os Sacrum*, the Haunch-Bone, and the *Os Pubis*. Its Situation.

The Figure of the Bladder is round and oblong, not unlike a Bottle with the Head turn'd downwards. 'Tis larger in ſome Perſons than in others, and when it happens to be too ſmall, the Perſon is oblig'd to piſs often. Its Figure and Size.

The Subſtance of the Bladder is Membranous, and conſequently impower'd to extend and contract it ſelf upon Occaſion. 'Tis compos'd of two peculiar Membranes, its common Membrane being nothing elſe but the *Peritonæum* that covers it. The firſt of the proper Membranes is thick, ſolid, hard, and interlac'd with Fleſhy Fibres, by vertue of which it contracts it ſelf in the voiding of Urine. The ſecond or Internal Membrane is thinner and finer, endow'd with a tender Senſe, and full of Chinks and Clefts which facilitate its Dilatation and Contraction. 'Tis cover'd with a ſort of Slime that guards off the Action of the Urinous Salts. Its Subſtance.

The Bladder is provided with two Nerves, one from the Eighth Pair which is inſerted in its Bottom; and another from the Pith of the *Os Sacrum* which terminates in its Neck. 'Tis nouriſh'd by Arteries from the Hypogaſtrick Branches, and returns the remainder of the imported Blood by ſmall Veins which terminate in the Hypogaſtrick Vein. Its Veſſels.

The Bladder has two remarkable Parts, namely the Bottom and the Neck. The former is the largeſt Part, and beſt qualified for the containing of Urine. In Men it reſts upon the *Inteſtinum Rectum*, and in Wo-

V

Its Bottom.

men

men upon the Womb. 'Tis pretty broad and wide, and growing ſmaller by degrees terminate in the Neck.

Its Neck. The Neck is the narroweſt and withall the thickeſt and moſt fleſhy part of the Bladder. 'Tis much longer, narrower, and fuller of Windings in Men than in Women. It has a ſmall circular Muſcle call'd the Sphincter of the Bladder, by vertue of which we open and ſhut its Orifice at pleaſure.

Its Connexion. The Bottom of the Bladder is tied to the Navil by the *Urachus*, which holds it up to prevent its falling down upon the Neck. The Neck reſts upon the ſtraight Gut, and the Neck of the Womb in Women.

Its Holes. The Bladder has three Holes, two Internal made by the Ureters near its Neck; and one External which gives Vent to the Urine.

Its Uſes. The Uſe of the Bladder is to receive and contain the Urine imported by Drops by the Ureters; to keep it as in a Ciſtern for ſome time, and to evacuate it upon occaſion by the means of the Sphincter, which opens and ſhuts purſuant to the will of the Perſon.

And now, GENTLEMEN, though I've perform'd my Promiſe in demonſtrating all the Parts that contribute to the Perfection of the Blood, and purge its Maſs of all that can annoy it; yet having deſign'd to ſhew you a perfect Anatomy, I ſhall take occaſion in this *Demonſtration* to lay before you the two large Veſſels of the *Abdomen*, namely the Great Artery and the *Vena Cava*.

The Great Artery and the *Vena Cava*.

The Artery is compos'd of ſeveral Membranes which are very ſtrong; for it contains a ſprightly volatil ſort of Blood that ſuffers a continual Agitation, and ſtands in need of Force to reſiſt the Motions imparted to the Blood from the Heart, On the other hand, the Membranes of the Vein are very thin and ſlender, for the Blood it contains in a State of Tranquillity, and 'tis employ'd in conducting it to the Heart.

Y The Great Artery. This Great Artery is the *Aorta*. It riſes directly out of the Left Ventricle of the Heart, where it receives the Blood in order to diſperſe it all over the Body. Upon this Occaſion I ſhall only ſhew you the Arteries it ſends to the *Abdomen* after its Perforation of the Diaphragm. Theſe are ſeven in number. The firſt is the *Cœliaca*, which ſplits into two Branches, one on the Right ſide bound for the Liver, and the other on the Left for the Spleen. The ſecond is the Upper Meſenterick

ſenterick which viſits the upper part of the Meſentery. The third is the Emulgents which run to the Kidneys. The fourth the Spermaticks which repair to the Parts that are calculated for Generation. The fifth the Lower Meſenterick which repairs to the Inteſtines and the lower part of the Meſentery. The ſixth is the *Lumbares* which ſerve the Muſcles of the Loins. The Seventh the Upper *Muſculares* which are loſt in the Fleſh.

When the *Aorta* reaches the *Os Sacrum*, it gets over the *Vena Cava*, and divides it ſelf into two large Arteries call'd the *Iliacæ*. Each ſide has one of 'em, which ſubdivides it ſelf into the Internal and External. The Internal Iliack Artery, which is the leaſt, detaches four Arteries, namely the *Sacra*, the *Muſcularis Inferior*, the *Umbilicalis*, and the Hypogaſtrick. The External Iliack which is the larger of the two, ſends out the Epigaſtrick and the *Pudenda*, and then marches to the Thighs, where it changes its Name, and aſſumes that of *Arteria Cruralis*. Here we take leave of it, meaning to ſhew it in its proper place. Divided into the *Iliacæ*.

Where the Iliack Artery terminates, there's a Vein of the like ſize which we call the *Iliaca Externa*, and which receives not only three other ſmall Veins, call'd *Muſcularis Inferior*, *Pudenda*, and *Epigaſtrica*; butlikewiſe the Internal Iliack Branch conſiſting of two Veins, namely the *Hypogaſtrica* and the *Muſcularis Media*. Theſe two Iliack Veins upon one ſide, and the other two upon the oppoſite ſide, begin about the *Os Sacrum* to form a very large Vein, call'd the aſcending *Vena Cava*, which is further enlarged by the Acceſſion of the *Sacra* and *Muſcularis Superior*. *Vena Cava Aſcendens.*

I would not have you to think, GENTLEMEN, that I was guilty of an Overſight in calling it the *Aſcendens*. 'Tis true, all Authors call it the *Deſcendens*, upon the plea that the Blood deſcends through it from the Liver, in order to nouriſh the Parts that lie below the Diaphragm. But ſince we are now aſſur'd that on the contrary it conveys the Blood from the Inferior Parts to the Heart, we have all reaſon to give it the Name of *Aſcendens*. It begins to aſſume the Name of *Vena Cava* upon the *Os Sacrum*, where the four *Iliacæ* joyn. As it riſes higher, 'tis join'd by four ſorts of Veins, *viz.* The *Lumbares*, which come from the Muſcles of the Logins. The *Spermaticæ* ſpringing Formerly call'd *Deſcendens.*

from the Instruments of Generation. The Emulgents from the Kidneys: and the *Adipoſæ* from the *Membrana Adipoſa* of the Reins. This done, the *Vena Cava Aſcendens* ſtrikes through the Diaphragm into the Breaſt, and terminates in the Right Ventricle of the Heart, where we now leave it till we come to demonſtrate the Parts contained in the Breaſt.

The FOURTH DEMONSTRATION.

Of the Inſtruments of Generation in Men.

SECT. I.

PUrſuant to my former Diviſion of the Parts contain'd in the *Abdomen* into three claſſes, 'tis neceſſary, GENTLEMEN, that the two laſt *Demonſtrations* of the Parts employ'd in Chylification and the refining of the Blood, ſhould be follow'd by a View of thoſe which are calculated for Generation. To avoid the confounding of the Parts peculiar to Man with thoſe of a Woman, I ſhall make two *Demonſtrations* upon this Subject.

Man comes into the World only in order to die. This is ſo conſtant a Truth that every ſtep he makes leads him to his End. Nothing can render him immortal; and all the Succours that Phyſick affords, do but put off Death for ſome days, without being able to avoid it. The only Solace we have under this indiſpenſible neceſſity of Dying, is that of ſeeing our ſelves ſpring up again in a Son, Now this Advantage is owing to the Parts calculated for Generation; for 'tis by them that Nature perpetuates it ſelf by producing new Creatures to ſupply the room of thoſe who are gone. And to the end that Man might be excited to the Production of his own Image; Nature has given to thoſe Parts ſuch a quick tender Senſe, and a tranſporting Titillation, that without liſtening to Reaſon, he courts Satisfaction; and indeed, 'tis oftentimes

the